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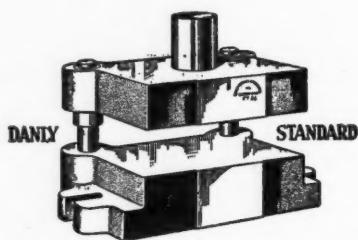
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Fig. A, at right, shows a Hisey Vertical Spindle Grinder mounted on a double head boring mill, grinding a tough steel gear, 30" in diameter. The job was bored and ground at one setting—thus retaining the original alignment and accuracy, also saving the time and expense of shifting to a grinder for the final operation.

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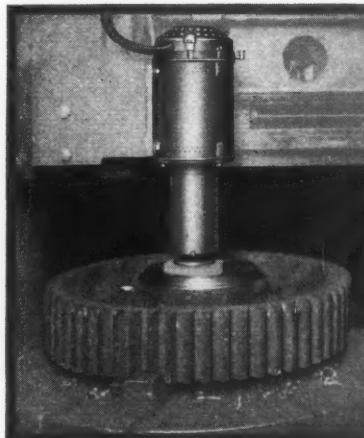


FIG. A

The sketches at right show a few of the many ways in which Hisey Vertical Spindle Grinders are used.

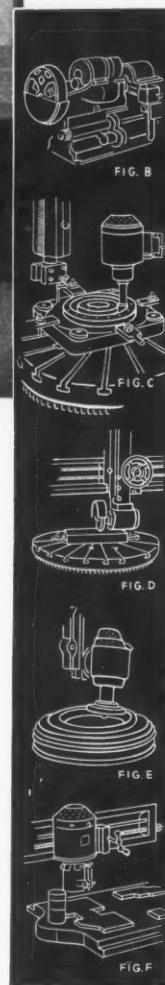
Fig. B—Mounted horizontally on lathe for thrust grinding automobile crank cases.

Fig. C—Mounted vertically on boring mill for grinding large blanking die.

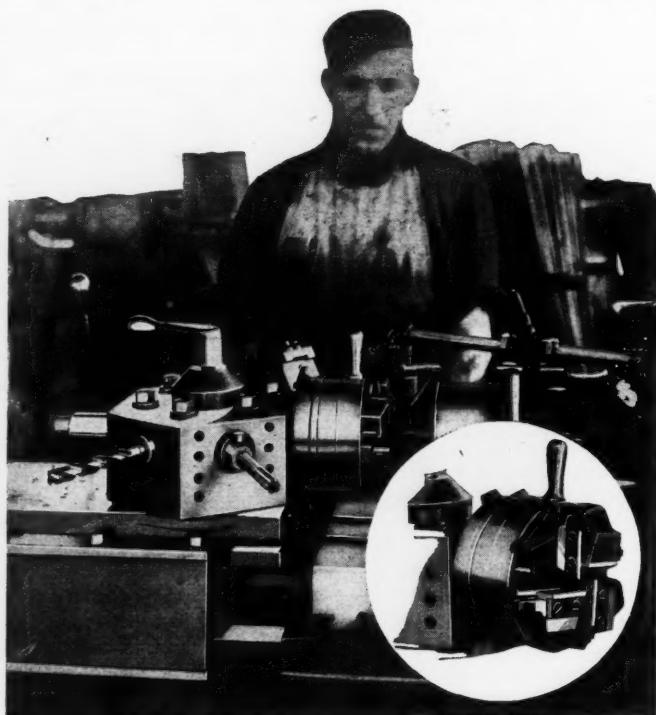
Fig. D—Mounted horizontally on boring mill for surface grinding large hydraulic press bed plates.

Fig. E—Mounted at angle for grinding ring and blanking dies, which are ground internally, externally and on top.

Fig. F—Mounted vertically on open side planer for grinding large dies.



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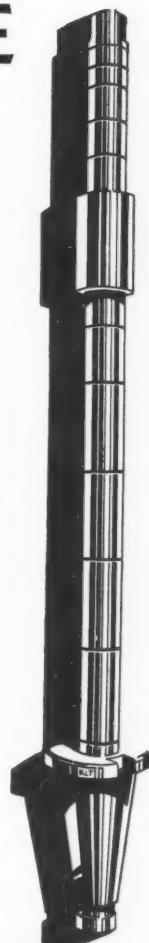
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Operation: Milling relief.

Material: Nickel Cast Iron.

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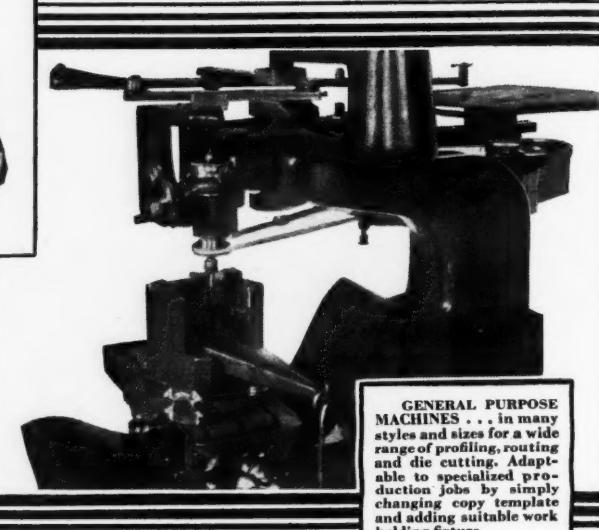
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Actual Cutting Time: 12 seconds.

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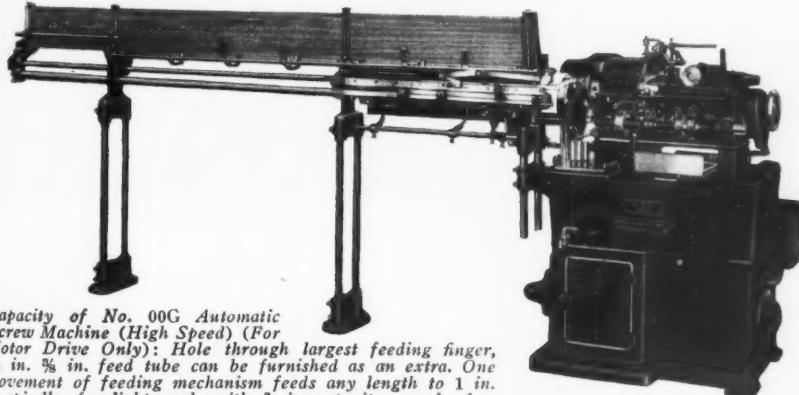
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Capacity of Automatic Rod Magazine for use with the No. 00G Machine: Takes rods to 10 ft. in length. Diameter, capacity of machine to a minimum of $\frac{1}{16}$ in. Depth of magazine, 10 in. Takes single row of rods.

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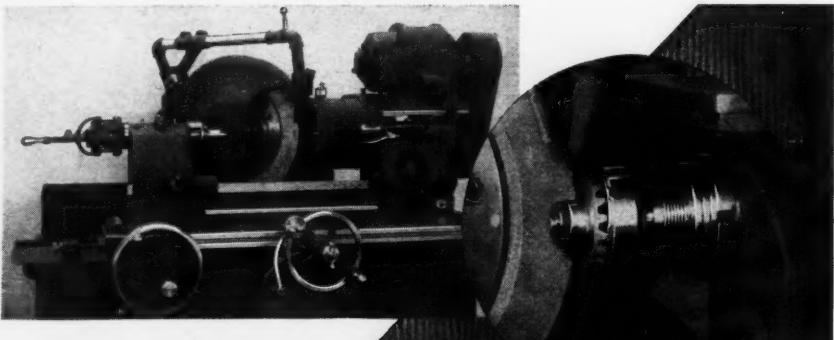
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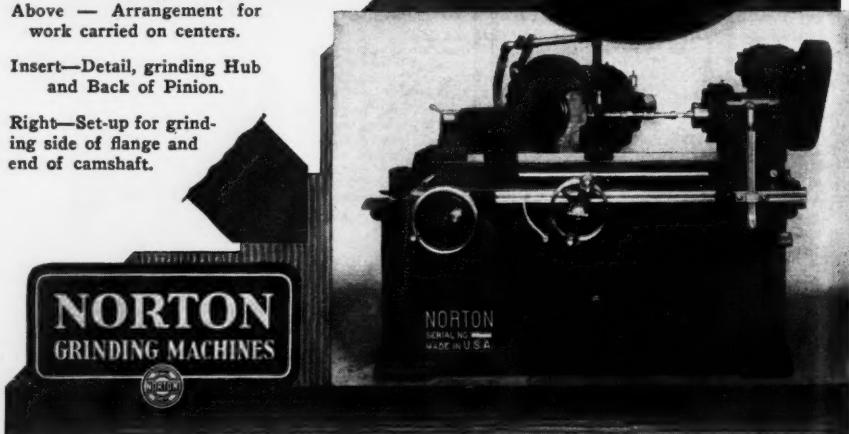
NORTON COMPANY, WORCESTER, MASSACHUSETTS



Above — Arrangement for work carried on centers.

Insert—Detail, grinding Hub and Back of Pinion.

Right—Set-up for grinding side of flange and end of camshaft.



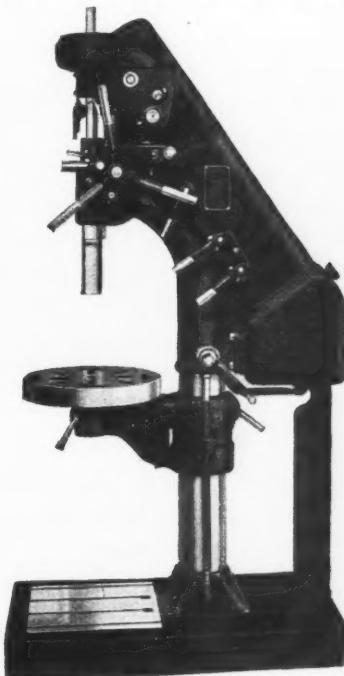
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A Magazine for Machine Shop Executives

HOWARD CAMPBELL, Editor

Vol. 3

JANUARY, 1931

No. 8

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MODERN Machine Shop

CINCINNATI, OHIO

JANUARY, 1931

VOL. 3, NO. 8

Locomotive Repairs On Production Basis At Juniata Shops

By HOWARD CAMPBELL

Due to the fact that the division of the Pennsylvania Railroad which lies between Pittsburgh and the Atlantic seaboard traverses a section in which a number of steep grades are encountered, heavy power of the most modern type is required, necessitating repair facilities of a corresponding type. Accordingly, the Juniata shops, located at Altoona, Pa., were laid out and equipped expressly for this class of work, the smaller shops on the system taking over the repairs on other classes of power.

The concentration of heavy repairs in one shop aided in the introduction of quantity production methods, by which the work is turned out easier, faster, and more economically. Repair parts

for locomotives have been standardized as far as possible, and a majority of all new parts are semi-finished in quantities in production machines so as to require a minimum of machining in the two machine bays of the repair shop proper. These parts in-

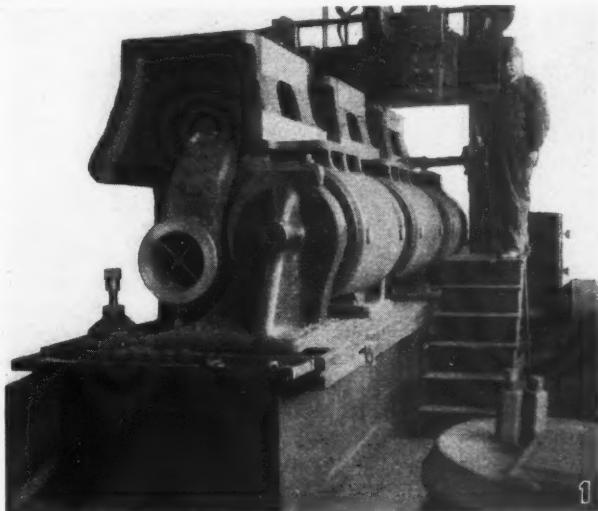


Fig. 1—Three cylinders are planed at one setting with this equipment. Time, complete, 27 hours.

clude crankpins, knuckle pins and bushings, valve motion parts, shoes and wedges, piston valves and bushings, and similar parts.

The valve motion pins and bushings are blanked out to established step sizes on automatic machines. The

shop is reduced to the minimum.

As far as possible, all parts are machined to standard sizes, making it unnecessary to spend time in fitting and making for interchangeability. Size blanks are provided, to which micrometers can be set, and plug and ring gauges are used wherever possible. Standardization and the resultant interchangeability make it unnecessary, in most cases,

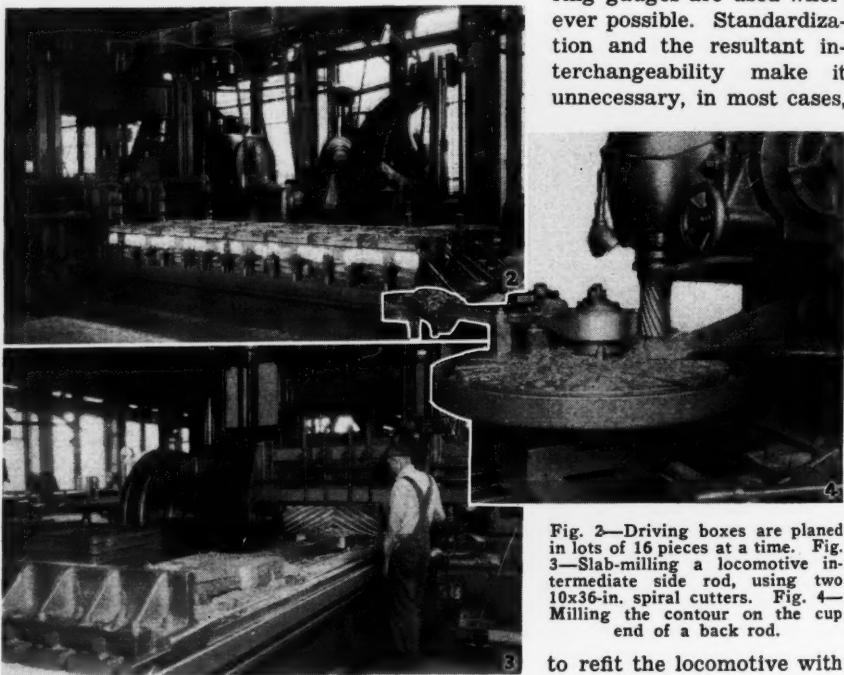


Fig. 2—Driving boxes are planed in lots of 16 pieces at a time. Fig. 3—Slab-milling a locomotive intermediate side rod, using two 10x36-in. spiral cutters. Fig. 4—Milling the contour on the cup end of a back rod.

wearing surfaces are then case hardened, and the bores of the bushings and all bearing surfaces are ground to gauge sizes by quantity production methods, making it only necessary, when fitting such parts to the engines, to grind the diameters and tapered ends of the pins. These methods are also followed in machining crankpins, knuckle pins, bushings, and so on. As a consequence, the amount of equipment actually required in the repair

to refit the locomotive with the same parts that were taken from it. Brasses, driving boxes, crossheads, valve and link motion parts, brake and spring rigging and other parts are sent to be overhauled in due process and put into stock, while the locomotive is refitted with parts that have previously been overhauled and brought up to standard. This procedure saves a great deal of time and handling of materials.

An example of the extent to which the use of fixtures has been carried

is found in Fig. 1, where an operation of planing cylinders is shown in process. Three cylinders are clamped

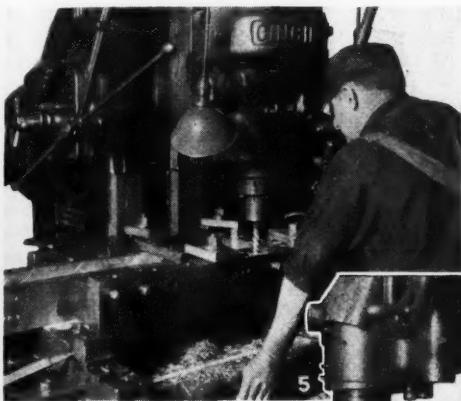


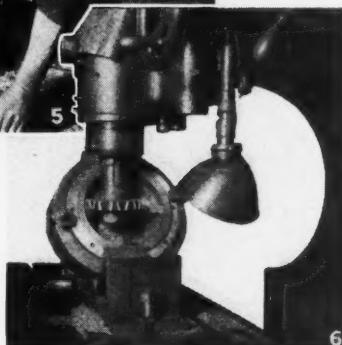
Fig. 5—Milling out the opening in the bearing end of a main rod. Fig. 6—Using a vertical mill and indexing fixture to machine the four lugs in an exhaust nozzle ring. Fig. 7—Milling two keyways simultaneously in a main driving axle.

in position in a series of fixtures, where they are held in place by tie rods of $1\frac{1}{2}$ in. diameter, extending through the fixtures and pulled up with nuts at either end. The operator has just finished machining the main frame fit and has removed the tools, each of which consists of a bar carrying a $1 \times \frac{3}{4}$ -in. high speed steel cutting tool. With this equipment, the three pieces are planed, complete, in 27 hours.

Another example of quantity production is shown in Fig. 2, where a planer can be seen in process of plan-

ing the hub surfaces of 16 driving boxes. The pieces are braced at the ends and clamped at the sides, as shown. By "ganging" the work in this manner, the 16 pieces are completed in 14 hours.

An excellent piece of production equipment is shown in Fig. 3, where the operation of slab-milling an intermediate side rod for a Class I-1s locomotive is shown in process. A gang of nine inserted-tooth spiral cutters is used on this operation, removing $\frac{3}{8}$ in. to $\frac{1}{2}$ in. of stock and finishing each side in one operation. Five of the cutters are left hand and four right hand. This is for the purpose of securing satisfactory distribution of the cutting compound and economical production of cutters.



The rod is finished in 6 hours, complete.

The extent to which the most modern equipment has been adapted for use wherever necessary in this shop is indicated by the set-ups shown in Fig. 4 and 5. Here are two jobs upon

which the latest types of vertical milling machines are employed. In Fig. 4, a 5 x 8-in. left-hand spiral cutter is being used to mill the contour of the cup end of a back rod. The piece is a steel forging, and the cutter is operating at a speed of 40 r.p.m., or 76 ft. per min. The roughing cut is approximately $\frac{1}{2}$ in. deep. Working to a layout line, the operation of milling the circular fit on this end is completed in 2 hours. The opposite end is machined in 1 hour.

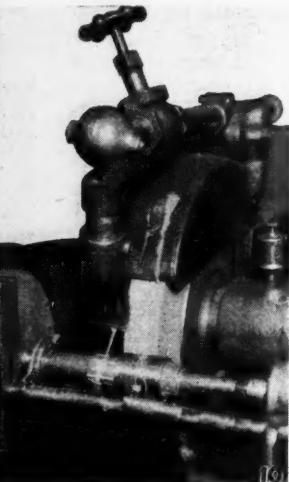
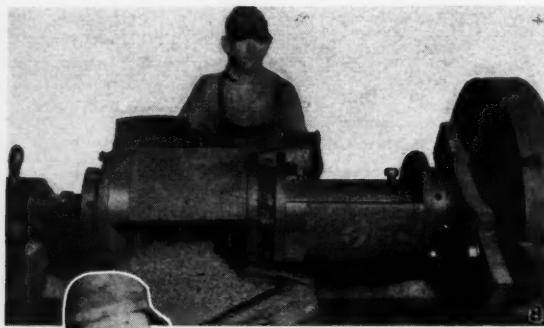
In Fig. 5 a Cincinnati vertical miller is being used to machine out the bearing end of a main rod. Before machining, the rod is laid out so that the operator will have an approximate idea as to the finish line, giving him an opportunity to rough the piece out within $\frac{1}{4}$ in. without gaging. An inside micrometer is used when setting the cutter for finishing, and the

dimensions in the bearing are held to within .003 in. A 1 $\frac{1}{4}$ -in. left-hand spiral cutter is used for the roughing operation and a 1-in. cutter of the same type for finishing. The end of the rod shown in the illustration is machined complete in $2\frac{1}{2}$ hr., and the open end is finished in 5 hours.

Another vertical miller is shown in Fig. 6, set up to mill the surfaces of four lugs in an exhaust nozzle ring. An indexing fixture is used, with a side milling cutter which is held in a horizontal position, as shown. The lugs are machined in this manner on account of their triangular section, and the operation is completed in twenty minutes.

Keyways in main driving axles are milled with the aid of the machine shown in operation in Fig. 7. Both keyways are milled at the same time and at exactly right angles to each

Fig. 8—Two driving box crown brasses are turned at a time by using this double arbor. The brasses counterbalance each other. Fig. 9—Crankpins are made from old axles which are cut to length, turned, and ground to size. Fig. 10—Grinding a case hardened steel link bushing, held on an expansion mandrel.





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the hands of Andrews

THEY are clever, cunning hands—these hands of Andrews. The blood of three generations of New England mechanics carries life, knowledge and sensitiveness to their finger tips. From the first day's work he ever did, Andrews has cut, filed and shaped metals to thousandths accuracy from inexorable blue-prints.

But not even the hands of Andrews can match the Pratt & Whitney Vertical Shaper for producing odd, irregular shapes

at low cost in a toolroom—especially when quantities of such parts must be produced.

For the P & W Vertical Shaper is the most versatile machine that ever transformed costly bench work into a mechanical process—that made former costs seem ridiculous in the light of the newer figures.

There will always be work for the hands of the Andrews, but a modern toolroom must install a Vertical Shaper to compete with other toolrooms or to fight the always rising costs.

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other, each keyway being $1\frac{1}{8}$ in. wide by $\frac{9}{16}$ in. deep. This operation is completed in 40 minutes.

Driving box crown brasses are turned in pairs on a double arbor as shown in Fig. 8. This method not only makes possible a saving in time over the older method of turning one

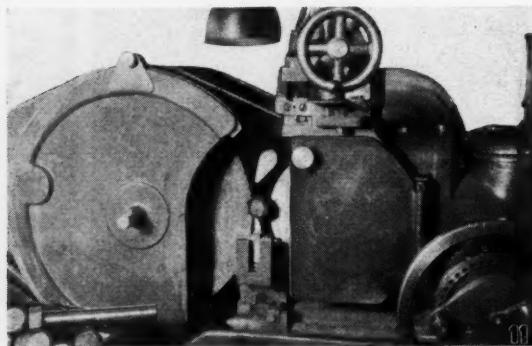


Fig. 11—Grinding a standard locomotive taper bolt in the centerless grinder. Fig. 12—Using a home-made device to grind-in throttle valves to the ring-seats.

piece at a time, but also provides an added advantage in that the brasses counterbalance each other, rendering extra weights unnecessary. As each brass is placed in position on the arbor, the end collar is screwed tightly against it and the pointed setscrews in the collar are screwed in, forcing the points of the screws into the piece. The arbor is driven by means of a square on the end, which fits into a corresponding aperture in a heavy bar which is clamped to the faceplate, thus eliminating the necessity for using a dog. Two turning tools are used—one for each brass—and two cuts are taken, removing all but $\frac{1}{8}$ in. of stock. The brasses are then removed and all other operations are completed, after which they are placed in the driving boxes and stored until the size for boring the brass is available. The interchangeability of driv-

ing boxes of the same class makes it unnecessary to replace the driving boxes and brasses on the same engines from which they were removed.

The advantages of the grinder for finishing cylindrical work have not been overlooked in selecting the equipment for this shop. Crankpins are

made from old axles which have been reclaimed for this purpose, the axle being cut to length, centered, and then ground to size in the grinding machine shown in operation in Fig. 9. Fig. 10 shows a steel link bushing in proc-



ess of being ground to size after case hardening. An expansion mandrel is used to hold the work. From $\frac{1}{8}$ to $\frac{1}{4}$ in. of stock is removed and the piece is finished to size in from $2\frac{1}{2}$ to 3 minutes. Fig. 11 shows a centerless grinder in operation, grinding a $1\frac{1}{4}$ -in. standard locomotive taper bolt with a taper of $\frac{1}{16}$ in. in 12 inches. The work is ground true and to size within .001 in. at a rate of less than

(Continued on page 46)

REPAIR PARTS — MADE BY LANDIS

If you are in need of medical attention, you place yourself in charge of a physician. Should you require legal advice, you consult a lawyer. Or, supposing that you contemplate the erection of a new office building, you retain an architect.

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71

Shop Sketching

A few suggestions on the making of free-hand drawings

By R. H. KASPER

DRAWING may rightly be called the universal language. Whether it be the carefully finished blueprint or the roughly penciled sketch on a piece of wrapping paper, that drawing may be of inestimable value in that it conveys an idea or the dimensions of a machine part. From the roughest to the finest drawing, the purpose is the same, to convey information in a clear and concise manner. Though the greatest value of a drawing may lie in the idea it conveys, the clarity with which that idea is expressed may add or detract from that value. The most clever idea, expressed in a slip-shod manner, may result in heavy losses due to errors and misconceptions.

The shop man, be he superintendent or helper, will find the ability to make acceptable and understandable pencil sketches of great value, as it enables him to suggest or interrogate with the assurance that the danger of misunderstanding is reduced

to a minimum. The ability to make sketches also aids in the rapid and accurate translation of sketches by others.

For the shop manager, the securing of contracts may depend greatly on the rapidity with which the plans can be formulated, so that the cost of the work may be quickly and accurately estimated. In the actual shop work, where quick delivery is essential, it is frequently necessary to start the machine work before the detail blueprints have been started. In such cases, the ability to make clear pencil sketches has a value beyond estimate.

The requirements of a good sketch are that the lines be practically straight, of the proper length and properly positioned. Curved lines, likewise, should be of uniform curvature, circles should be approximately round. It is not to be expected that a pencil sketch be as accurately drawn as a blueprint; the former may be badly



Fig. 1—The third finger guides the hand in drawing a straight line.

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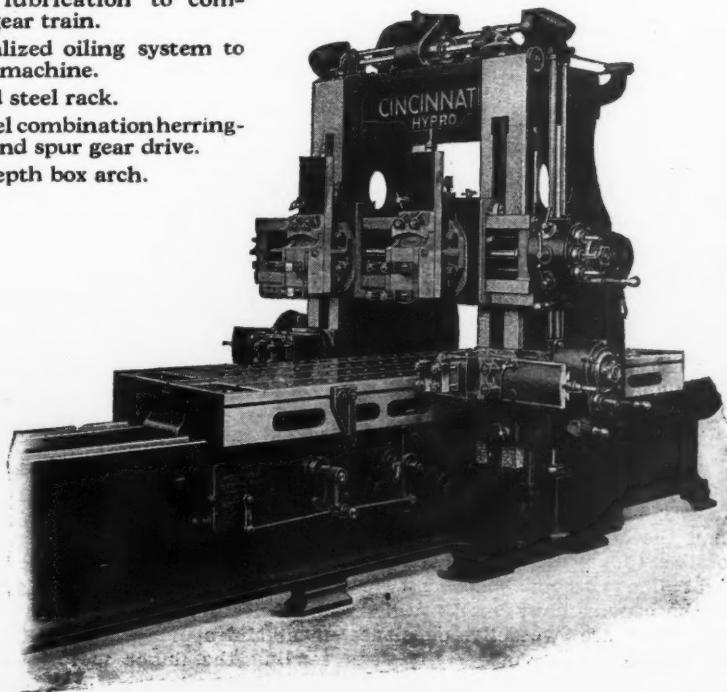
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and artistically out of proportion, imperfect without exciting comment, whereas a blueprint may evoke smiles with but a small percentage of the same artistic defects. However, this



Fig. 2—If the line is near the center of the sheet, the fourth finger is used as a guide.

should not be offered as an excuse for making careless sketches; a neat, correctly proportioned sketch may be made with the expenditure of very little more effort, and the necessary skill may be acquired with very little practice.

The commonly accepted definition of a sketch is a drawing produced without the aid of instruments other than pencil and paper. To state that a straight line or a perfect circle cannot be drawn without instruments is quite correct, but it is equally impossible even with the aid of instruments; the properties of straightness and roundness actually exist in theory only. But it is quite possible, without the use of instruments, to draw lines which, for all practical purposes, may be considered straight or curved, as the case may be. To any but the highly skilled artist, it is impossible to produce an acceptably straight line without something to guide the pencil; many highly skilled draughtsmen are woefully deficient in this respect, being absolutely de-

pendent upon the T square and triangle for straight line work. As pencil sketches are usually made on the bench, or before a machine, the use of these accessories is automatically eliminated.

When making sketches, the most convenient paper to use is that which is purchased in pads with a stiff cardboard back. As the edges of these pads are cut straight and square with each other, they serve perfectly as guides for the pencil hand. For drawing lines close to the edge of the paper, the third finger may be used as a guide along the edge of the pad, as shown in Fig. 1. The pencil is held in the usual manner, the second finger resting on top of the paper to steady the pencil. For lines which are farther removed from the edge of the paper, the little finger is used. It is important that the wrist be kept from swinging as the hand sweeps along the paper, though stiffness is to be avoided. For lines which are closer to the center of the sheet, the little finger is extended, as shown in



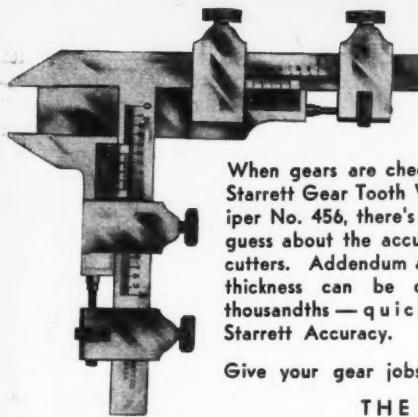
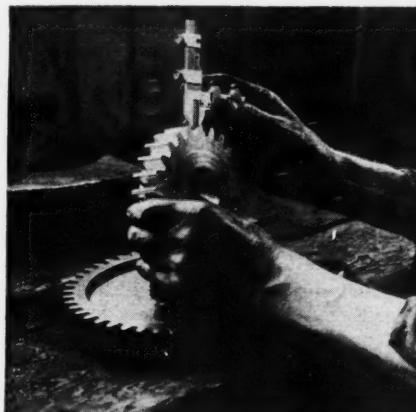
Fig. 3—By bending the wrist, the hand can be guided across the top of the paper.

Fig. 2. The pencil should be held somewhat back from the point, as this permits greater freedom of movement and avoids the necessity of extending the finger more than abso-

January, 1931

Modern Machine Shop 21

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lutely necessary. As much as possible of the little finger should rest along the edge of the pad, as it aids in holding the hand steady.

Lines on the far edge of the paper are drawn in a similar manner, it merely being necessary to bend the wrist in a natural manner, as shown in Fig. 3. Lines close to the near edge of the paper are more difficult to draw unless they are quite close to the edge, in which case the back of the little finger is used. Lines

marked. In other words, the hand and mind are automatically influenced by providing a target to aim at. Oblique lines should be drawn rapidly, as speed in the movement of the hand will result in less deviation from a straight path. However, proficiency can only be acquired by practice.

The angular relation of oblique lines to other lines will naturally affect the appearance of the sketch, as the accuracy with which they are placed controls the proportioning of adjacent parts. The average mechanic can draw an angle of forty-five degrees with a fair degree of accuracy. It will therefore prove helpful to visualize all angles as multiples or divisions of forty-five degrees. Thus, a twenty-degree angle will be visualized as slightly less than half of forty-five; fifty degrees as slightly more than forty-five, and so on.

By entirely freehand methods it is quite impossible to accurately draw a circle. But the use of two pencils, employed as a rudimentary compass, makes it possible to draw circles with surprising accuracy. In Fig. 4 is shown the method of drawing small circles. The pencils are held as for ordinary writing, with the thumb and second finger opposite each other. The size of the circle drawn is controlled by the depth to which the second finger is pushed between the pencils. One pencil point is then used as a center, but as it would be impossible to revolve the other pencil entirely around it, the paper is turned under the pencils. The pencil used as a center should be given slightly more pressure than the other, to keep it from moving off the mark. It will also prove helpful to use a soft pencil for drawing the circle.

Obviously, the range of circles which can be drawn in the above manner will be limited, therefore, for

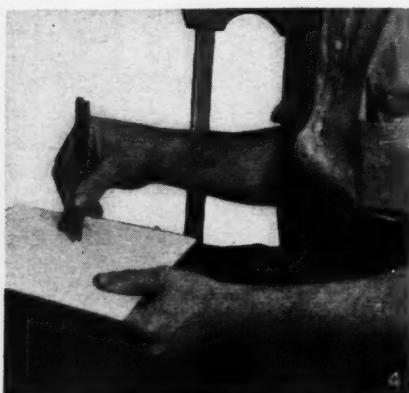


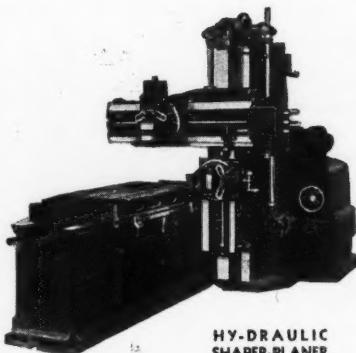
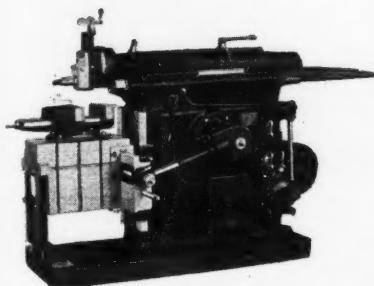
Fig. 4—Using two pencils as a divider to draw a small circle.

more than a few inches removed from the near edge can best be drawn by turning the pad end for end. Similarly, the pad should be reversed for lines along the left edge, as it is practically impossible to use any fingers of the right hand along the left edge of the paper. Of course, these instructions are reversed for a left-handed worker.

When drawing oblique lines, the edges of the pad cannot be used as guides, skill being the main requisite, though that skill may be easily acquired by proper procedure. Oblique lines can be drawn quite accurately, both as to length and straightness, if the stopping point of the line is first



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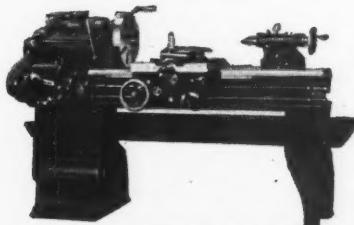
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larger circles, the pencils should be held as shown in Fig. 5. The pencil used for drawing the circle is held between the thumb and index finger in the usual manner. The other pencil, which is used as a center, is held be-



Fig. 5—Large circles can be drawn by holding the pencils like this.

tween the second and third fingers on the lower end, and between the index and second fingers on the upper end. In this manner, the latter pencil is held firmly but moveably; in fact, the hand becomes practically an adjustable compass. For still larger circles or arcs, the pencils are held as shown in Fig. 6. The drawing pencil is held between the thumb and index finger, passing between the index and second finger on the upper end. The other pencil is held against the palm of the hand by the last three fingers, the diameter of the circle being governed by the length to which the latter pencil projects beyond the palm of the hand. The pencil used as a center will have a tendency to move off the mark unless held down quite firmly on the paper.

Very large arcs, which cannot be drawn by the above methods, may be executed by using the bone of the elbow as a center, swinging the entire lower arm. However, in such cases, it will be necessary to use a

drawing board or other support for the elbow.

Circles or arcs which must connect with other lines should be drawn first, and then the other lines drawn to meet them, as a slight lack of parallelism in the straight lines will be less noticeable than the failure of a curved line to meet another. Irregular curves will offer no difficulty if they are considered as a series of regular arcs, of varying radii, placed in proper relation with each other.

Though the straightness of the lines and the regularity of the curves determine, to a considerable extent, the appearance of the finished sketch, the accuracy of the final result is just as greatly influenced by the accuracy with which the parts are relatively proportioned. The ability to produce well proportioned sketches depends primarily upon the ability to judge the relative sizes of the parts. Here,

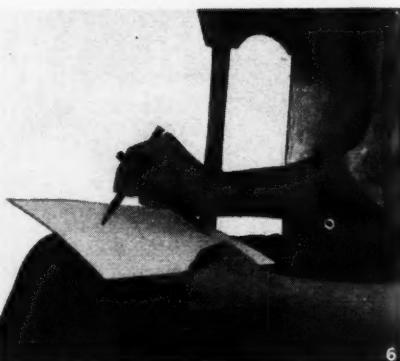
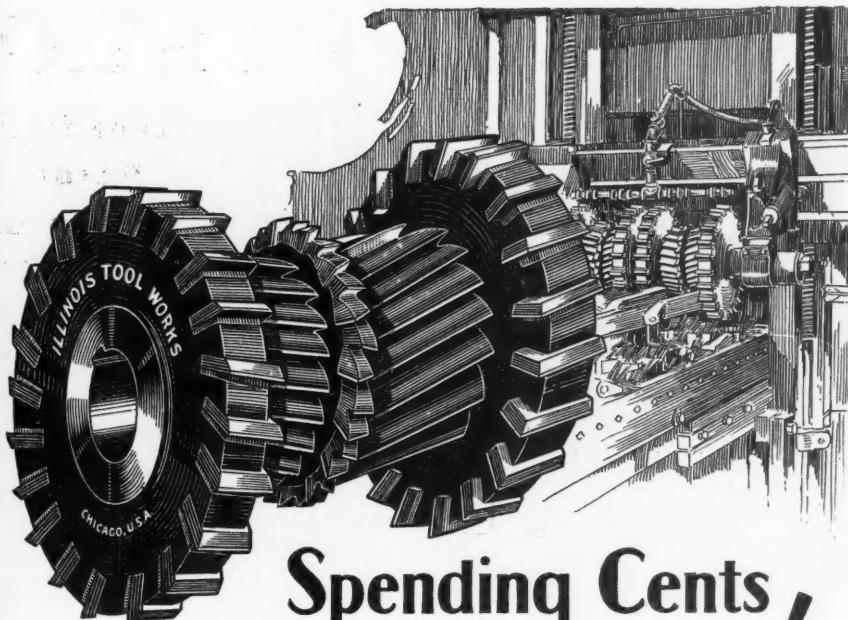


Fig. 6—Still larger circles can be drawn by holding the pencils as shown here.

again, practice and systematic procedure play an important part. The advice frequently given a student of drawing is to start the work from the center line, building up, piece by piece, toward the outside. Though this is good advice in the average

(Continued on page 36)



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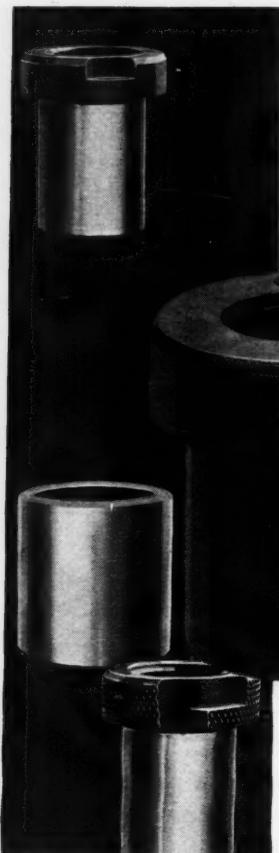
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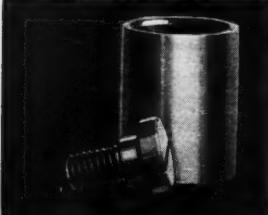




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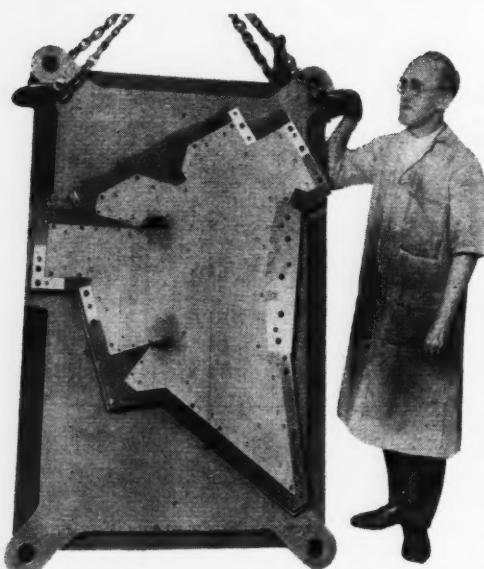
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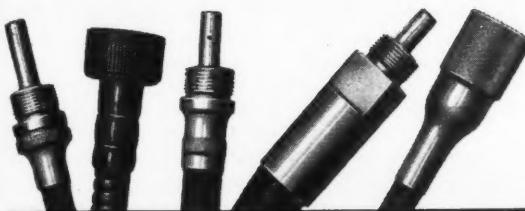
Says Frank W. Hack

By PHILIP WINTER

THE past twenty-five years have seen many changes in the methods of American industry, particularly among the metal-manufacturing plants. The haphazard methods of former years have been supplanted by methods which have reduced the selection of workers, selection of materials, and movement of materials through the various manufacturing processes to a science. Since the first rough efforts were made in the direction of eliminating waste, supplanting hard manual labor with mechanically-operated devices, and saving time by the use of specialized tools and machines, the search for faster and cheaper methods has become increasingly intense. Industry no longer takes it for granted that certain methods or processes are cheaper; the necessary analysis is made and the amount of possible saving is computed down to a fraction of a cent. That is undoubtedly one of the reasons for

the growth of the modern tool shop; in many cases such a shop can give the manufacturer better service, at lower costs, than can be obtained from his own toolroom.

Toolmaking is a branch of metal work for which a complete assortment of equipment is required, in order to take care of the requests for service which may come from manufacturers of all sorts of products. Equipment must be available for finishing pieces of all shapes and sizes to any degree of accuracy required, processing the parts through the necessary heat treatments, and so on. The more modern shops have elaborated upon their manufacturing service by including within their organizations experienced designers who can lay out a complete set of tooling to produce a given number of parts per day at the lowest possible cost for manufacturing. To the large industry which is equipped to carry on all activities



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relative to its own business, such a service may be called upon only when its own toolroom is overcrowded; to the small or medium size plant where each dollar spent must be productive

production. The corn-stripper panel die shown at the head of this article is an excellent example of the type of work for which this plant is especially adapted.

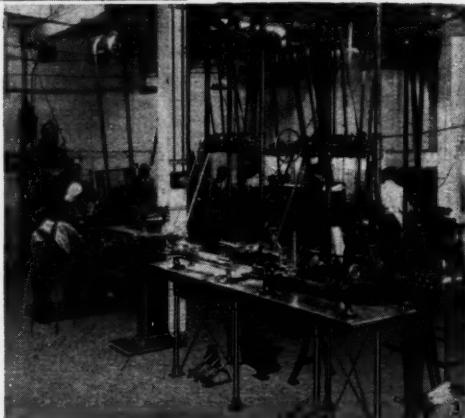
Mr. Hack says, "The so-called 'good old days' of hopeful guess-work in manufacturing are gone. In the good old days the average machine shop was a dark, dirty place, in which everyone was supposed to know how to do anything, and where practically everything needed was made within the four walls of the shop. If a machine broke down, the mechanic stopped work and repaired it.



Fig. 2—One side of the shop, showing arrangement of equipment. Fig. 3—The bench lathes occupy special benches.

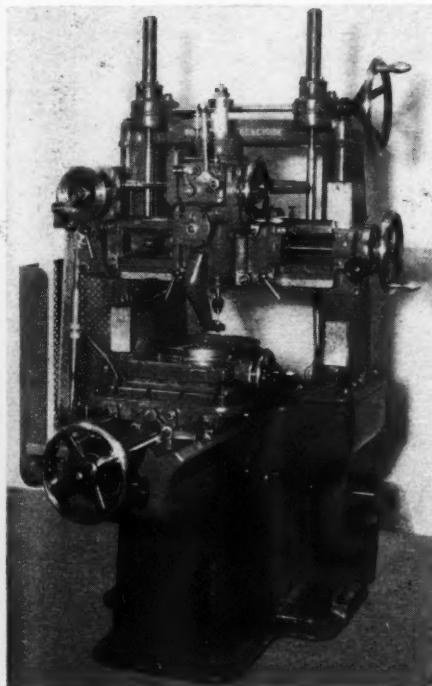
of the best possible results, such a service is invaluable.

Among the better-known tool shops in the Middle West is that of the Cramp Manufacturing Company, of Chicago. Here is a shop that was laid out and built especially for the production of special tools, dies, jigs, and fixtures of all kinds. Mr. Frank W. Hack, President and General Manager, is an engineer who has specialized on this class of work, and every man in his organization has been selected because of special qualifications for the work to be done. This company offers a complete tooling service, including the designing and building of anything required from an arbor to a complete set of jigs and fixtures, ready for



If the belt broke or slipped off the pulley, the man operating the machine spliced it again or fetched a ladder and put it back on the pulley. If he needed a tool, he went to the blacksmith shop and gave personal instructions to the blacksmith as to the kind of tool he wanted. However, as inter-

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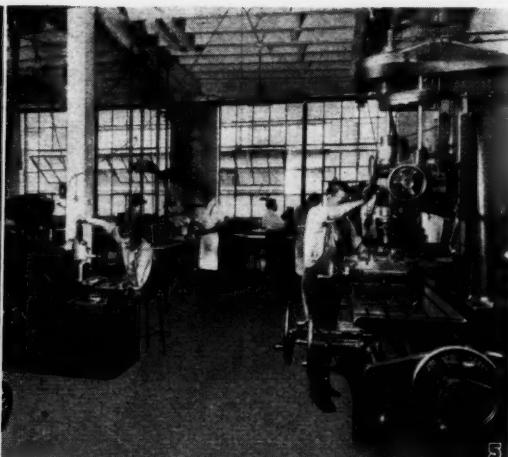
Table Area, 15" x 20½"; Movement of Table, 18"; Movement of Spindle Slide, 12"; Distance between Uprights, 23½"; Maximum Distance below Cross Rail, 14½"; Feed of Spindle, 5"; Morse Cone of Spindle, No. 2; Maximum Drilling Capacity, 1"; Maximum Boring Capacity, 2¼"; Power Feeds, .004 and .008; **Guaranteed Accuracy, ± .0002.**

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4



5

Fig. 4—Here are 3 of the 21 milling machines. Fig. 5—At the right is an especially large jig borer. Fig. 6—The 4 planers are arranged in a row in a separate bay.

changeable part production got under way, maintenance work became separated from the manufacturing operations. Certain all-round machinists were detailed for repairing equipment; a department was set aside in each manufacturing plant for the toolroom, and expert mechanics began specializing on tool work. Sometimes the toolroom contained but a few men and various machines throughout the plant were used for tool work, as necessity dictated, but a shop without a toolroom wasn't considered complete.

"With the increase in the efficiency of manufacturing methods, however, the scene is changing again. Manufacturers have discovered that the manufacture of a given product and the manufacture of tools are two sep-



6

arate and distinct lines of work, and that while they may be highly efficient in the production of the goods upon which they are specializing, their tools must be produced under the supervision of men who are specialists on the design and manufacture of tools and fixtures. A great deal of money can be wasted on the toolroom if the conditions are not right.

"Toolmaking, as a highly specialized industrial art, is an entirely different business than production manufacturing, requiring an entirely different type of personnel, an elaborate

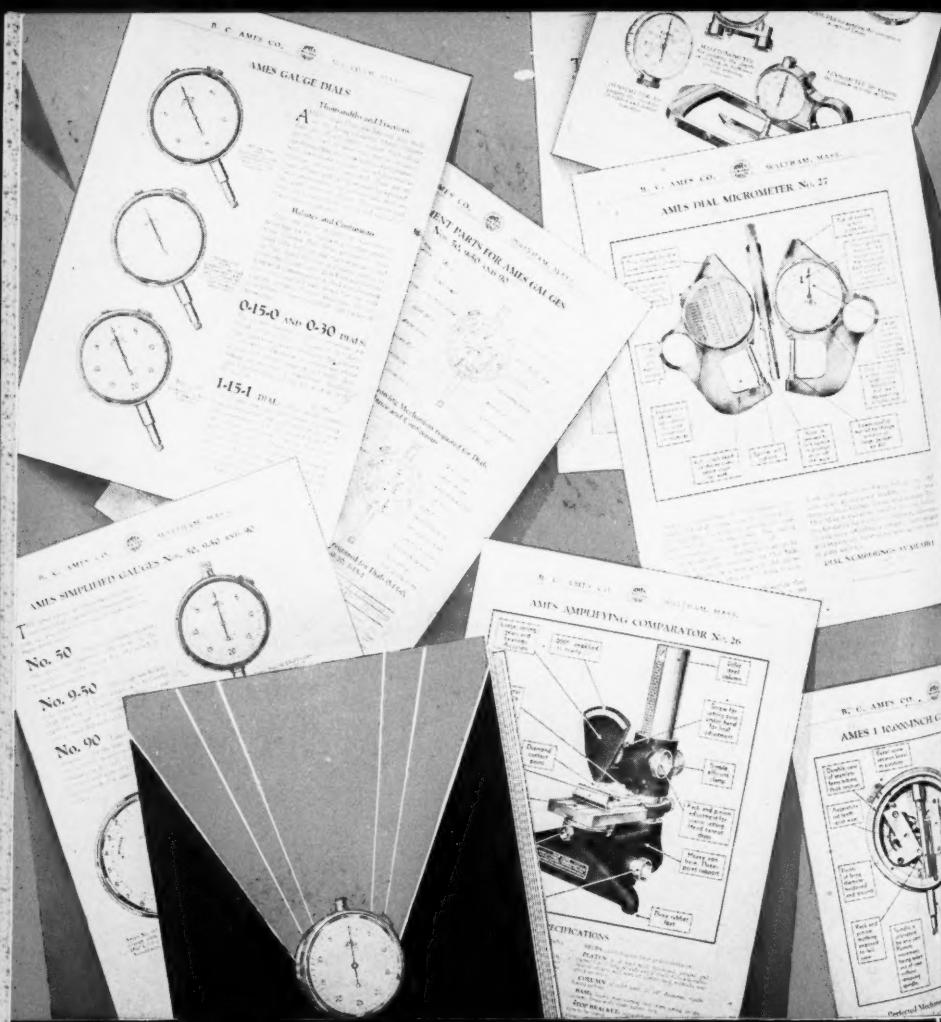
(Continued on page 35)

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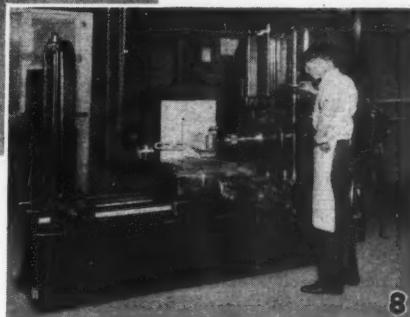
Fig. 7—A view of the shaper department.
Fig. 8—One of the Giddings & Lewis horizontal boring machines.

First Aid to American Industry (Continued from page 32)

inventory of machinery and tools of extra fine manufacture and many of which are intended for tool work only, and the services of trained designing engineers upon whose skill and ability depends the responsibility for saving or wasting unlimited amounts of money.

"This situation has fostered another development in American industry—the highly specialized tool shop which is built, equipped, and manned especially for the task of making tools, dies, jigs, fixtures, and anything else in the way of special equipment that may be necessary to the manufacture of a given article."

The Cramp Manufacturing Company is a good example of the type of organization referred to. This shop is equipped to take care of complete tooling programs for the manufacture of any type of metal product—no matter how small or how large. The Cramp organization has laid out, de-



signed, and built complete sets of tools for the manufacture of internal combustion engines, radios, washing machines, stoves, toys, and other metal products. The shop equipment includes machines and tools with which tools can be made for every-

thing from watches to locomotives. The shop building is of the modern "daylight" construction, with glass in every available foot of side-wall space in order to admit the maximum of light. The natural light is supplemented by an overhead lighting system that is calculated to deliver from 16 to 18 foot-candles of light at the bench or machine. The building is 150 x 175 feet, containing approximately 26,000 square feet of floor space. A view of one side of the shop, showing the arrangement of benches and machines, is shown in Fig. 2.

The plant equipment includes somewhat over 100 machine tools, each of which has been selected because of its special fitness for fine, accurate work. The 13 lathes are all of the quick change type, and range in size up to 28-in. swing. This figure does not

include the bench lathes and speed lathes. A part of the bench lathe equipment can be seen in Fig. 3.

The 21 milling machines include all types and sizes from the small bench miller to the large No. 3 horizontal and No. 5 vertical millers. Some of the milling equipment is shown in Fig. 4. One of the jig borers is shown in operation in Fig. 5. One of these machines is a standard No. 1, and the other is a special No. 2 of extra large capacity. Large flat surfaces are machined with the aid of the four planers shown in Fig. 6, and smaller work is handled in the shapers shown in action in Fig. 7. Other equipment includes 17 sawing and filing machines, 23 drill presses, 3 boring mills, 12 grinders of various types, and so on. One of the Giddings & Lewis horizontal boring machines is shown in operation in Fig. 8.

The toolcrib, which is centrally located, is built on the "see-it-yourself" plan, with three windows located some distance apart and the tools arranged so that they can all be seen from the outside of the crib. This arrangement makes it possible for a toolmaker to actually see and select the tool desired and thus arguments or discussions between the mechanics and the toolcrib employees as to what tools are available are avoided. The small tool equipment is divided into three classes, with the milling cutters and grinding wheels in one lot, drills, reamers, and similar edge tools in another lot, and accessories, such as dogs, attachments, and so on in another. The sections containing these tools are divided according to the windows and the tools are issued through the windows facing the individual sections in which the three different kinds of tools are kept. This method of handling tools provides better service and saves more time and discussion than is at first apparent.

From the time the order is received until the tool is ready for delivery, work in process moves with the precision of a machine—credit for which is mostly due to the excellent production system in use in this plant. Through the courtesy of Mr. Hack this system will be described in the February issue of *Modern Machine Shop*.

Shop Sketching

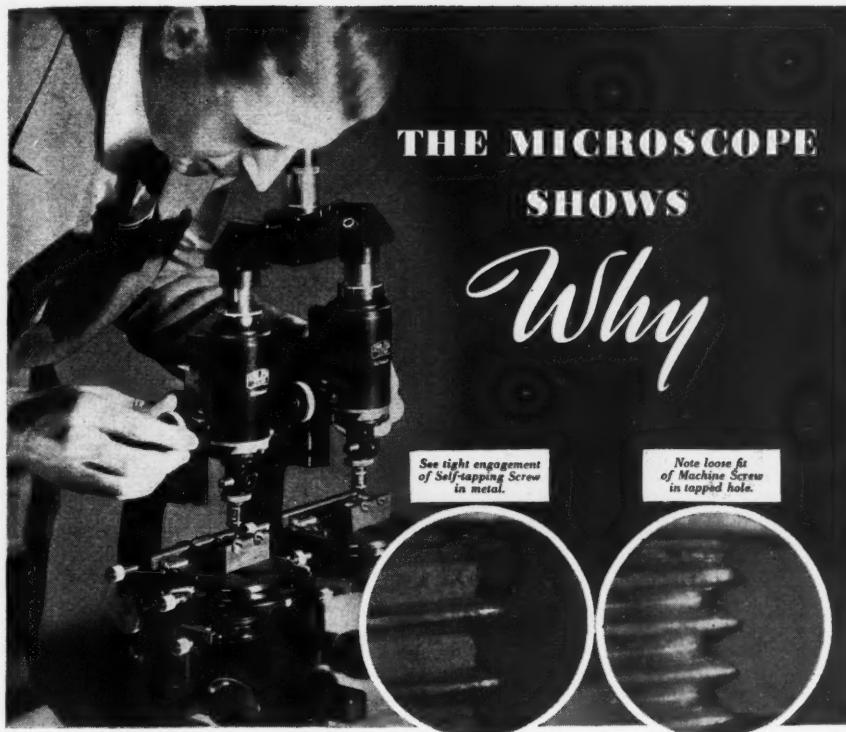
(Continued from page 24)

case, much depends on the shape of the part being drawn. If the part consists of a long base or column, best proportioning will ordinarily be obtained by drawing the longer lines first, building up with the shorter lines. An aid in proper proportioning will be found in the guide sheet which usually accompanies a pad of sketching paper. This sheet is heavily lined into equal squares and is placed under the sheet, the lines being visible through the paper.

In conclusion let it be stated that a pencil sketch, no matter how well done, can be classed as a makeshift only, and cannot be expected to supplant the well made blueprint. However, they may be equally satisfactory as a means of conveying mechanical information, and although not possessing good wear resisting qualities, their greatest value lies in the low cost and the rapidity of execution.

Landis Forming and Threading Machine Booklet

Bulletin No. E-70, issued by the Landis Machine Co., Inc., Waynesboro, Pa., describes and illustrates all details of the Landis $\frac{3}{4}$ -in. and 1-in. Automatic Forming and Threading Machines. Each operating part of these machines is taken up in turn and its construction, functions, methods of lubricating, accessibility, and so on are discussed at length. Copies of the bulletin will be sent without charge to machine shop executives.



THE MICROSCOPE SHOWS Why

Self-tapping Screws HOLD BETTER

 Comparative laboratory tests conducted by unbiased authorities prove that Hardened Self-tapping Sheet Metal Screws make better fastenings than machine screws or bolts and nuts. Practical demonstrations of this fact are found in hundreds of assemblies subjected to severe stresses of tension, shear and vibration.

"But Why does this Screw hold better?", an engineer will often ask. It is a natural question. A Screw that forms a thread in sheet iron, steel, aluminum and Bakelite as it is turned into an untapped hole, is revolutionary in principle. Such simplicity has not been associated with the making of secure fastenings.

The microscope shows why a Self-tapping Screw holds better under vibration, the chief cause of fastening failure. Remembering that the security of a fastening under vibration depends upon how tightly the Screw threads are engaged in the metal, look at the unretouched microphotographs here. It is easy to see why the Self-tapping Screw holds better.

Its threads are so firmly embedded in the metal that screw and metal are practically one. But between the machine screw threads and the tapped threads

(commercial tolerance) there is considerable space . . . space which permits the screw to loosen under vibration.

Under stresses of tension and shear, a stronger fastening is obtained with the Self-tapping Screw because it possesses greater tensile strength than ordinary screws, being made of a special steel, scientifically treated.

It is obvious that the extreme simplicity and ease of making fastenings with these unique Screws must result in great economy of assembly time and labor. Where these Screws are used there is no costly tapping or tapping troubles. No fumbling with bolts and nuts either. Elimination of such fastening difficulties has resulted in large savings by thousands of users of Self-tapping Screws

PARKER-KALON CORP., Dept. E, 192-196 Varick St., New York

More Facts in these two Free booklets!

Proof of Economy

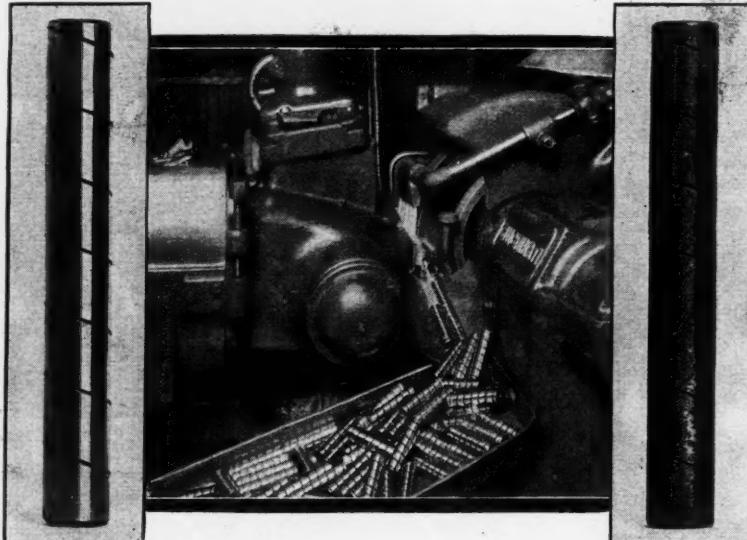


Proof of Security



PARKER-KALON
HARDENED SELF-TAPPING
Sheet Metal Screws

MADE IN U.S.A. AND CANADA - MADE IN U.S.A. - 100% CARBON STEEL



HOCUT Prevents RUST A three-weeks test proves HOCUT Superiority

A WATER-MIXED cutting oil cannot replace a rust preventative, but it should protect parts between operations—even for several days. This is particularly true when the parts are ground or have a highly finished surface.

Houghton's HOCUT stands alone in that it coats the work with a rust-preventative film even when diluted with 20 to 50 parts of water. The photo shows the result of three weeks' exposure; the bright part was protected with 40 to 1 solution of HOCUT, the rusted one with a 40 to 1 mixture of ordinary emulsifiable oil and water.

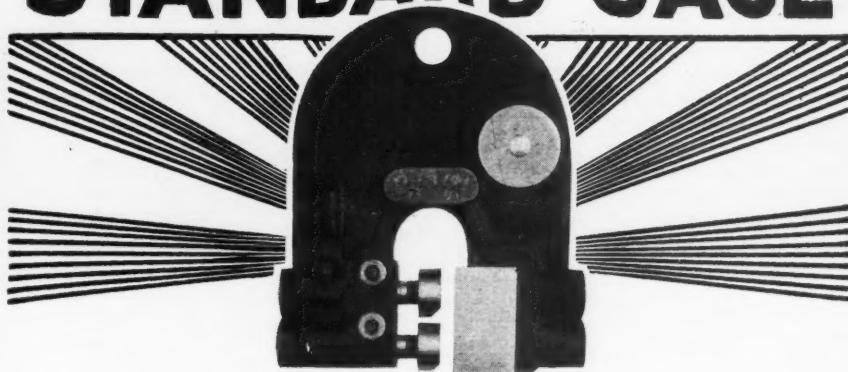
Houghton's HOCUT has far greater cooling power than emulsions or soap mixtures. This greater cooling power permits higher speeds and often doubles tool life between grinds.



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(ACTUAL SIZE)

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HERE is the new "Midget" Type STANDARD Adjustable Limit Snap Gage designed especially for gaging small parts such as slots, lengths, shoulders, diameters, etc.

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The "Midget" Snap Gage is made in four sizes ranging from 0 to $\frac{1}{2}$ " capacity. Weights range from two ounces for the small size to $3\frac{1}{2}$ ounces for the largest size.

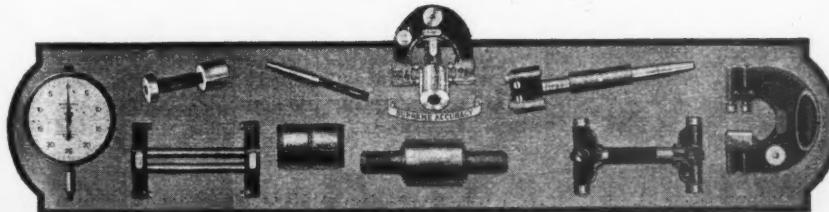
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POUGHKEEPSIE, N. Y.



Plus and Minus Five Thousandths

By GEORGE HENRY FISHER

THE fur was flying around the shop the other day. It all started because the old man happened to take one of his periodic walks through the plant. While no one is so undiplomatic as to voice his sentiments openly, more than one of the department heads wish he would keep his nose in his private office "where it belongs." It seems that whenever he takes a crazy notion to go rambling around the place, someone gets his foot into it.

Mildred, his "steno," could have told us in advance that the old man was on the war-path. It was Monday morning, and she knew by the expression on his face that Phillips, that young squirt in the credit department, had had the poor judgment to trim the old man at golf on the previous afternoon. And on top of that, as Mildred sensed by a few remarks that were dropped, his wife had left the toast in the machine too long that morning—and the old man likes his toast soft in the middle.

So, perhaps someone was bound to get it, anyway. And this time it just happened to be Frank, the chief inspector. The old man was sniffing around in the machine shop and happened to run into a pile of scrap over in the corner. He beckoned to Joe, the foreman. Joe eased over toward the scrap-pile with a "What now?" look on his face.

"Is this stuff all scrap?" the old man wanted to know, picking up a partly-machined "364 bracket."

Joe wiped his chin and gazed gin-

gerly at the rejected part. "Yes, sir," he answered, taking the bracket from the old man's hands, and scrutinizing it. "This '364' was cut three thousandths under-size in milling the face."

The old man began to boil up. "Three thousandths?" he repeated, heatedly. "It could still be used, couldn't it? What's the tolerance on that cut?"

The foreman scratched his head reflectively. "Eh, plus and minus five thousandths," he said.

The old man pursed his lips. "What's the matter—machine need tuning up?" He began to fumble around for another part, so as not to embarrass Joe by seeming too direct.

The foreman thought awhile. "No, I reckon not," he answered. "But of course we just broke in a young fellow on that machine, and, well, I suppose we can't expect a green-horn to work to such close limits without getting some scrap." There was just a trace of irony in his tone. He knew the old man liked the idea of working in younger fellows on the machines.

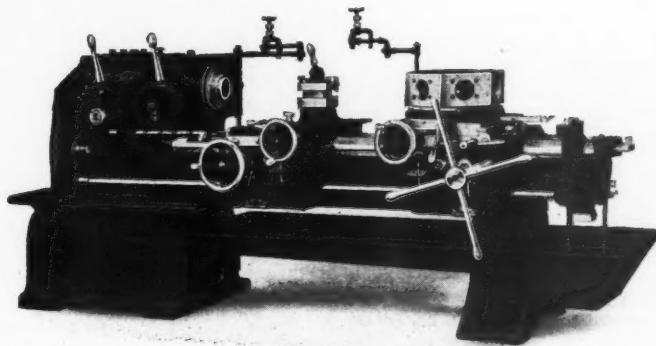
"Well, it shouldn't take a skilled machinist to run a miller," the old man came back. But then he added: "Why are the limits so close for that facing cut?"

This was a poser for Joe, and all he could do was pass the buck. "The print calls for that tolerance," he said, wagging his head. Of course this was no answer to the old man's question, but Joe was machine shop foreman—not designer. Somehow, the old man realized that Joe's reply carried a dig

A protest, in fiction style, against the "policy" of designers and draftsmen of complicating inspection procedure, retarding production, and increasing costs by adding unnecessarily close tolerances to blueprint specifications.

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HERE are the features of the latest No. 1 and No. 2 Cincinnati Acme Universal Heavy Type Turret Lathe which assure you *More Production... Lower Costs... and Closer Accuracy*:

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Can be furnished with either the Semi-Universal or Full Universal turrett.

Write for Bulletin

**THE ACME MACHINE TOOL CO.
CINCINNATI, OHIO**

at "engineering," and he quickly began to finger another piece of scrap. It happened to be a yoke for the "386 Axle." "What's wrong with this one?" the old man asked.

Joe gave it the once over. "Blow-holes," he announced, after turning it over a couple of times. He got out his pencil and indicated the tiny recesses in the casting which had been uncovered by a lathe operation.

The old man put on his specs and squinted at the place where Joe's pencil rested. "I don't see—oh, yes, *there* they are!" said the boss. "But the casting is just as strong, isn't it?"

"Yes, I should think so," replied the foreman—"but the print says: 'casting must be entirely free from sand-holes, blow-holes, and other foundry imperfections'."

Well, the old man saw that he could get nothing on Joe. All the foreman did throughout the entire indignation meeting over that pile of scrap was to stick up for his men and pass the buck to Inspection and Engineering. The old man wanted inexpensive labor in the shop. He liked the way the new time study man was standardizing the jobs—making it easy to break new men in on them in a few hours. And he had sense enough to see that a new man must be expected to spoil a piece once in a while, especially on close-limit work. But why in thunder did the limits have to be so blanketed close on every dimension? He felt that his designers knew their stuff. He didn't want to ask them a lot of questions, because it seemed they always had a fast comeback, backed up by a lot of mathematical and scientific terms which the boss didn't savvy. So after backing gracefully out of several arguments with "Engineering," the old man had learned to take their work for granted. "After all," he said to himself, "they're a pretty 'heady' bunch. They probably know what

they're doing." And that was the end of it.

What he could do, though—and often did—was to get the foundry on the wire and burn up the switchboard telling them about the terrible castings they were sending. If they didn't promise to do better, by gosh! somebody else would get the work in the future. So the foundry would promise to mend its ways. But the best foundry in the country can't produce perfect castings on a production basis—at minimum prices—without an occasional hitch. The boss had changed foundries more than once. He knew that foundries were only "human." It was a continuous battle between price, service, and quality. The old man yelled for good castings, quick delivery, and hollered about the rates. He soon discovered that a good compromise was the best he could expect.

Then there was Inspection. That was it! By criminally! He'd call Frank onto the carpet! Frank came in answer to the telephone operator's buzz.

"I was looking over the rejections, this morning," began his nibs. "Can't you fellows use a little judgment about turning down some of those parts? It seems to me that we're scrapping a lot of good usable stuff. You know, it costs money to machine those castings. Of course, I realize that some blowholes are invisible until after a cut has been taken on the machine. I don't expect you to reject bad castings before you can see the holes, but a lot of the stuff is perfectly O. K. from an assembly and appearance standpoint. There's no sense in being too finicky about points that don't affect the utility of the product."

"Well," said Frank, shifting his weight to the other foot, and coughing a trifle nervously—"but we've got to follow the drawings, chief. —I—"

The chief flared up! There it was

IT'S OUT

**the NEW
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*Gear Tooth
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**What Are
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A HEAVIER, much sturdier machine with knee cast integral with the base, permanent spindle mounting, head forms integral part of the table — these are a few of the construction features that provide rigidity and freedom from vibration.

The fixture head has a cylindrical base and can be revolved to any desired angle to cutter spindle. This revolving base carries a dial to facilitate setting at proper angle.

The Peerless *always* has been unmatched in flexible operation and this new model offers all the flexibility of the former machine in shape of chamfer, roundness, intermittent cutting, either straight forty-five degrees or ball point, and skipping one or more teeth on a recessing or chamfering operation. It also retains the feature of no indexing so that every movement removes metal.

The machine is motor driven with motor in base and presents a modern, rapid cutting machine tool for this class of work.

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DAYTON, OHIO, U.S.A.

again. "Drawings! Prints!—Engin—Dammit!" he said, "the engineering department makes the prints to show how the parts *should* look. They represent the conditions as we *desire* to have them. But a little discrepancy one way or the other doesn't necessarily call for a rejection. An inspector should use a little *judgment!*"

Frank's pride was injured a little at that word "judgment." He knew as well as anyone that many pieces were being scrapped which could be pressed into service.

"Listen, chief," he began. "If I could personally inspect every part that is turned out, no doubt we could save a lot of scrap. But it's much cheaper, as you know, to put low-priced checkers on the job—hand them the print, and tell them to be governed by it. If we wanted to pay for inspectors who had judgment we might solve the problem. But that would take money, and to my notion, it shouldn't be necessary. The inspectors should have drawings that they could follow without danger of throwing out good material."

The boss reflected a moment. "You mean that in designing the parts, inexact measurements should be shown. A fine bunch of drawings we'd have!"

"They don't need to be inexact," countered the chief inspector, "but they should indicate the widest tolerance possible. And they should plainly state just how far we can go in the matter of foundry imperfections. To quote an instance, we show, on our print of the large size exhaust tube: 'Casting must not be warped or distorted in any way.' But the foundry can't turn out a thousand tube castings a day without making a few that show a slight warpage. Strict inspection on the foundry would cost us money, and as a matter of fact a slight warpage, if away from the outlet of the tube, doesn't matter in the least—either in machining or assembly. A

high-priced inspector could be expected to know those little things. But if we want low priced checkers on the job we can't expect to have them save scrap for us."

The old man began to pace the floor. "Well, what's the answer—in your opinion?" The question sounded more like a challenge than a query.

"I believe, chief, that our drawings should all be gone over and all unnecessarily close tolerances removed. You know, Benson, in the engineering, has a pet theory that all machine work should be done within five thousandths of the specified dimension. Every machine cut marked on drawings is labeled 'plus and minus 0.005,' whether it needs it or not. And every casting specification has tacked onto it: 'Must be free from blowholes, sandholes, warpage, or distortion of any kind.' It's a piece of nonsense, if you ask me."

Frank was getting more and more excited as he went along. He well knew that the engineering department had the old man bullied. Normally, the inspector would have known better than to talk that way. But the boss had got under Frank's collar by the crack about using judgment, and the chief inspector had by this time thrown caution overboard.

Down in his heart the boss knew that Frank had the right dope. But he could have fired him for the personal indictment that Frank's tone carried, for the inspector might just as well have said: "Why the devil don't you snap out of it and take the designing department off its high horse, instead of letting them bulldoze you and high-hat you into bowing to them!"

The next day the old man walked into the office of the chief engineer. He sat down opposite Benson, who was buried under a stack of tracings, and quietly laid down the law to that official. He forgot about the latter's

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IT is REAL economy to use GENUINE THOR RIVET SETS and CHISELS in your riveting and chipping hammers, because they last so much longer. Many firms are now realizing that a hammer is only as efficient as the rivet set or chisel with which it is equipped. They have discovered that the way to cut production costs is to standardize on GENUINE THOR ACCESSORIES.

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college education and his ability to prove anything he chose by a few deft manipulations of the slide rule. The situation was gone over from soup to nuts, including all viewpoints, from designing, operating and inspection to selling, packing and shipping. In plain words the boss told the chief engineer that what was wanted was low-cost production — not hair-line accuracy in drawings. He explained that theory was tolerable only insofar as it facilitated practice, and that low operating costs were more desirable than adherence to a policy. Therefore the old habit of sticking "plus and minus .005" onto every machining dimension must pass into oblivion.

The ultimate results of the upheaval were gratifying. The only thing is that, while Frank knows that most of the credit is due him for the change, he still kind of squirms guiltily when ever he recalls how he sailed into the old man.

Locomotive Repairs At Juniata

(Continued from page 16)

20 seconds per piece. Work up to 10 in. in length can be ground either straight or taper on this machine.

The continuous effort to replace hand operations with power has resulted in the development of a number of interesting tools, one of which is shown in Fig. 12. Here a throttle chamber has been rigged up with an air motor to grind-in throttle valves to their ring-seats. The ring is bolted to the chamber, and the valve is driven by a shank in the spindle of the motor. The motor is held by two arms that can be raised to allow the work to be changed.

Hardening Failures

UNEVEN heat is probably the cause of most of the hardening failures, particularly in the case of carbon and low alloy steels. It is indicated by a

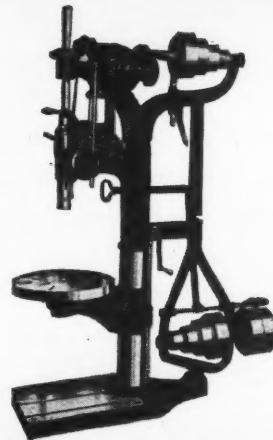
peculiar circular cracking and breaking of the steel. The face of the fracture often shows lines of demarkation between the different zones. The appearance of the break is sometimes described as "cup and egg," which describes it well. Uneven heating is caused by improper equipment, by fast heating, or premature removal of the steel. Uneven heating results when steel is charged into a furnace that is above the desired temperature and when the steel is removed from the furnace as soon as it appears to be up to heat. The furnace temperature should never be raised above hardening temperature to hasten heating, and the steel should never be removed until it has had time to heat to the same temperature clear through.

Electroplating Aluminum

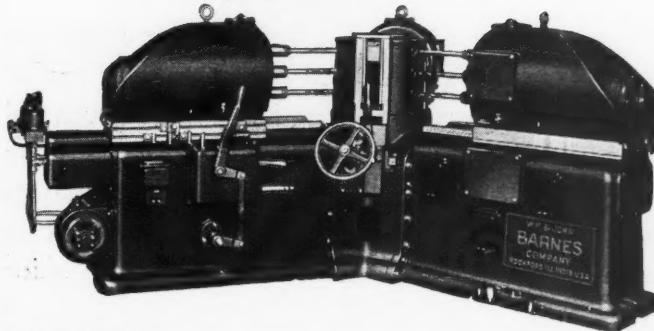
According to a booklet that has been issued by the Aluminum Company of America, Pittsburgh, Penna., most platers have avoided the task of plating on aluminum because they thought it difficult and unreliable. This, according to the book, is a mistaken idea, and aluminum is actually as easy to plate on as other metals. The book contains 36 pages of $5\frac{1}{4} \times 8$ -in. size, and consists of a detailed explanation as to methods of procedure in electroplating on aluminum in its various forms. Instructions are given for alkaline cleaning, acid cleaning, plating with either chromium or zinc on a smooth surface, plating on a roughened surface, plating pure aluminum, strong alloys, and castings. Formulas are given for nickel baths that may be used satisfactorily on aluminum, with detailed instructions as to methods of plating, room temperatures, and recommended thicknesses. Chapters are devoted to Corrosion Tests, and Analysis of Solutions. Plating diagrams are included, together with micrographs showing the manner in which the plating metals deposit on the aluminum surfaces. A copy of this booklet will be sent without charge to any mechanical executive who sends in a request on his firm letterhead.

STANDARD & SPECIAL DRILLING & BORING MACHINES

A complete line of standard upright drilling machines — single spindle and gangs — stationary and sliding head—belt and motor drive — with or without attachments.



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Special single-spindle or multiple-spindle machines, working from one direction or several directions simultaneously, with or without indexing table; for high production and heavy duty drilling, boring, reaming and similar operations.

Above is shown a 3-way drilling and reaming machine with elevating fixture.

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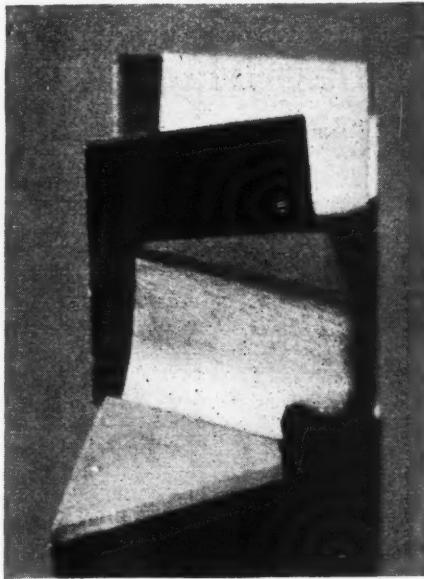
Old Chucks - Guilty of Grand Larcency Should Be Sentenced For Life

A new high-speed machine, strong, sturdy, accurate, latest improvements in drives and change gears, heat treated, hardened, and ground spindles —yet all the mechanical skill and effort that have gone into its construction are practically lost when such a machine is burdened with a badly worn chuck. An old chuck is a thief of accuracy, power, and speed. » » » » »

Thousands of chucks are still in use throughout industrial America which had outgrown their usefulness when high speed was in its infancy. Such old time chucking equipment should be replaced with new high-speed models. No job is operating at its highest point of efficiency unless the chuck is as modern and well cared for as the machine on which it is used. » » » » »

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ROCKFORD, ILLINOIS, U. S. A.

Air Clamping Fixtures For High Production Milling Machines

By A. C. JANKE

MODERN automatic milling machines have become so tremendously productive that their capacity is, in many instances, much greater

fixture design has been receiving more attention and very gratifying results are apparent. The aim, of course, has been primarily to reduce the loading time by reducing the amount of manual work in the machine cycle. Many kinds of devices have contributed to the results which have been obtained, but perhaps the most interesting is the one under consideration—the application of air

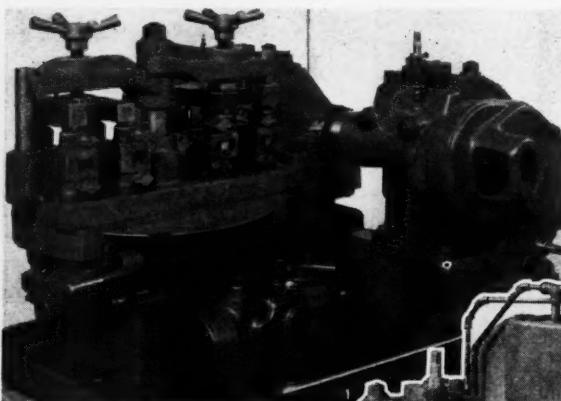


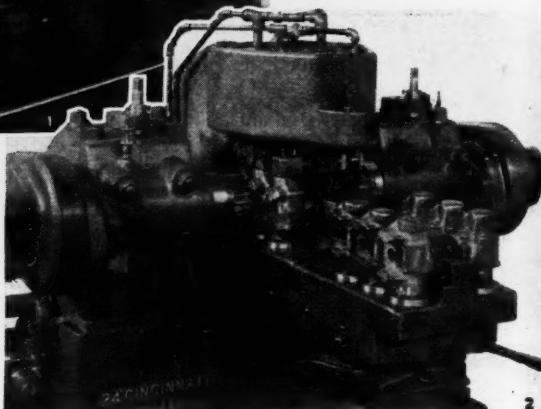
Fig. 1—Four pieces are held in each end of this fixture, and are clamped by hand. Time per piece, .205 min.

Fig. 2—The same job handled in a fixture that holds six pieces at each end, clamping by air.

Time per piece, .16 min.

than that of the men who operate them. Production is limited either because the machine is idle while the operator is reloading the fixture or because the work can be milled faster than it can be loaded. Station milling, rotary milling, and reciprocating fall into this latter class, where the two operations can be carried out at the same time.

In the effort to increase production,



pressure cylinders as a means of clamping.

A very good example of the value of air clamping is afforded by a comparison of the equipments shown in Figs. 1 and 2. These two machines are identical and are performing ex-

STRAIGHT CARBON TOOL STEELS

**"THAT'S THE
TOOL STEEL I WANT!"**

... says Sam of the Tool Room



WHEN it comes to water-hardening tool steels, Sam knows what he's talking about because he's tried them all. Low priced, high priced, and medium priced—good, bad and indifferent—they've passed through his hands to be fashioned into fine tools.

Now Sam doesn't take any more chances. He knows that some water-hardening tool steel is naturally tough and some is naturally brittle. He knows how to tell the difference . . . right in his own department . . . without the aid of a laboratory.

He cuts a sample disc from the end of his bar . . . then quenches it in brine from 1550° F. . . . and breaks it to see the fracture. After this abusive treatment, if it remains fine grained and tough . . . he knows he has the kind that makes good tools. If it is coarse grained and brittle, he refuses to risk a hundred dollars in labor trying to make tools from it.

From actual experience Sam knows that he can always get tough carbon tool steel when he picks out a bar with this label on it.

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4063 Forest Park Ave.

actly the same operation on the same part (Fig. 3), using the same speed and feed—103 r.p.m. and 16.6 in. per minute respectively. Both use the in-

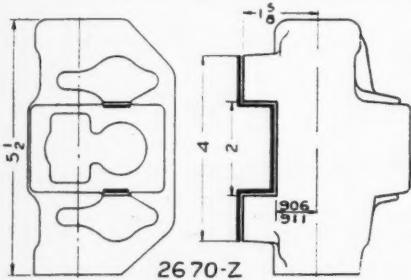


Fig. 3—Drawing of piece shown in process in Figs. 1 and 2.

dex base method of milling and the work is located in the fixture in about the same manner. The only difference in the jobs is in the method of clamping and the number of pieces held.

In Fig. 1 a fixture on each end of the index base holds four pieces which are clamped down over the top. The clamps are equalizing and operated by a single pilot wheel and the entire mechanism swings out of the way for convenience in loading.

The machine cycle is simple and semi-automatic in nature. The operator throws a lever located at the side of the machine on top of the feed box and the table starts forward at rapid traverse, automatically trips into feed as it approaches the cut, mills four pieces of work which are held in the fixture on the forward end of the index base, and returns to the starting position at

rapid traverse. The base is then indexed 180 deg. by hand and the cycle repeated. The operator removes and loads work into the idle fixture at the rear of the index base while that in the other fixture is being milled. This equipment may be considered a good example of high production tooling for an automatic milling machine, the total time per piece being .205 minutes. An actual production of 254 pieces per hour may be expected, allowing 15 per cent for the ordinary shop conditions which might disturb the routine of operation.

As it again became necessary to increase production on this work, the equipment shown in Fig. 2 was built to meet the need. The same index base method of milling was employed, but each fixture was arranged to hold six pieces instead of four as previ-

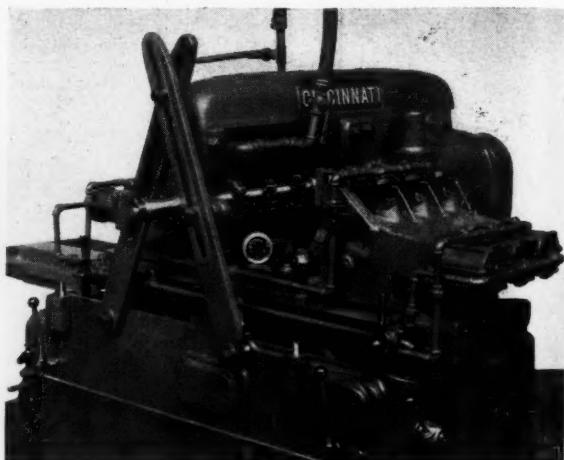


Fig. 4—An excellent example of a high production milling fixture, arranged for air clamping.

ously. Practically the same locating means were employed, but the outstanding feature of the design is that the fixture itself carries no clamping mechanism of any kind. Instead, the

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clamping mechanism is carried in an entirely separate unit mounted directly on the machine table to the rear of the index base and overhanging one end of it. The unit contains a nest of small cylinders mounted vertically which press straight down on top of the work. This method of clamping was found to be very effective and it is, of course, very fast. It was found that the equipment was much easier to handle than that shown in Fig. 1, even though the rate of production was greatly increased.

The cycle of operations is as follows: While the work in the forward end of the fixture is being milled, the operator reloads six pieces into the rear fixture. After the machine table has returned at rapid traverse, the operator unclamps the index base by throwing the lever at the right and this same motion also oper-

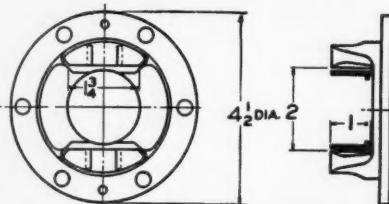


Fig. 5—Piece for which the fixture shown in Fig. 4 was designed.

ates a valve in the air line which reverses the pressure in the clamping cylinder and unclamps the work. The operator then indexes the base 180 deg. by hand, bringing the new work under the clamping mechanism, and

a single motion of the same lever at the side of the index base locates and clamps it and applies pressure to the work clamps.

With this apparatus the time per

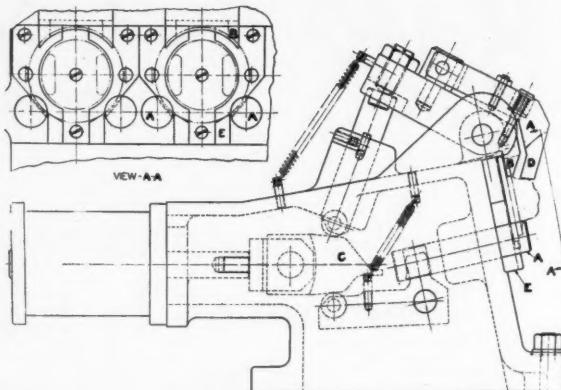


Fig. 6—Drawing of universal joint flange yoke fixture.

piece was reduced to .16 minutes which may be conservatively figured to give a production of 326 pieces per hour. This is an increase in production of about 28 per cent over the other method, and as the number of manual operations required was considerably reduced, the work was much less fatiguing to the operator.

The equipment shown in Fig. 4 is a very fine example of a high production milling fixture arranged for air clamping. The job is to rough mill the fork of the flange yoke for an automobile universal joint as shown in Fig. 5. Two fixtures, each holding three pieces, are mounted on the table of a Cincinnati Hydromatic Miller with the cutter gang between the fixtures. The table reciprocates automatically and the operator reloads the idle fixture while the work in the other is being milled. As the length of the cut is very short and three pieces are milled at one time, it was

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necessary that the fixtures be made very convenient for loading and unloading and as they worked out, practically all that the operator had to do was to pick out the milled part and set a new one in its place. All locat-

pair of spring-loaded fingers **D** which come down ahead of the clamp and locate the work axially by pressing on top of the sides of the fork. The fixture shown is mounted on the left end of the machine table where the cutting pressure is down. The other fixture is similar in action, but is arranged to withstand upward pressure of the cutters. Air pressure is applied by throwing the valve mounted on the side of the machine table, by hand, and it is automatically released by the dogs mounted on the side of the bed on the return stroke of the table.

The machine cycle is entirely automatic, the table advancing rapidly to the cut, tripping into feed, feeding at a vari-

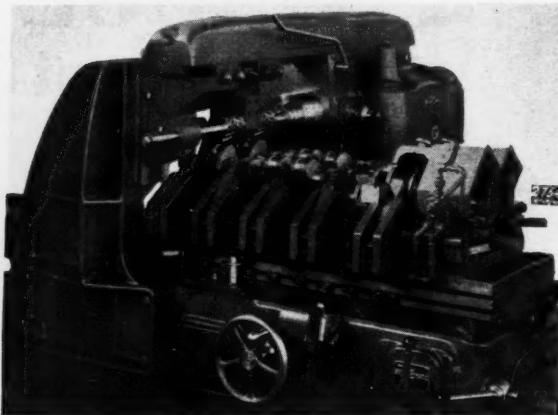


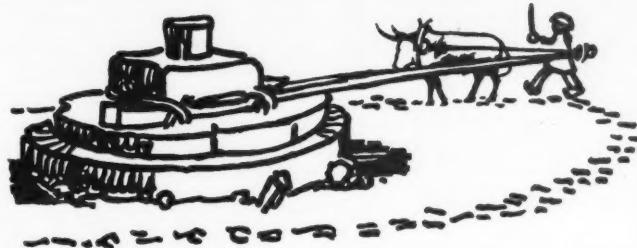
Fig. 7—Fixture for milling counterweight seats on a crankshaft.

ing and clamping operations are performed mechanically.

A diagrammatic sketch of the fixture is shown in Fig. 6. Before coming to this operation, the flange of the yoke has been turned and faced and location is taken from these surfaces. The work is set in a vee block, **E**, which is tilted back just enough so that gravity will hold it in place. When the air pressure is applied, it is gripped by two fingers at the bottom **A** and a clamp at the top **B** which hold it securely in place for milling. The clamps are actuated by a cam **C** mounted on the end of the piston rod, against which rollers bear for transmitting the motion. The cam itself is of the floating type to equalize the clamping action, being held in position between the rollers by spring pressure. On the top of the upper clamp is a

able rate of from 8 in. to 2 in. per minute, and finally striking a positive stop where the table dwells while the cutters make one or two revolutions to clean up the cut. The table then starts back automatically at rapid traverse and as soon as the cutters have cleared the work the table stops. This stop is placed in the cycle merely as a safety factor so that if the loading of the idle fixture has not been completed, there will be no danger of a wreck or injury to the operator. If the loading is completed before the safety stop is reached, the operator can, merely by resting his hand on one of the two levers shown alongside of the bed, cut the stop out of the cycle and the table will continue on to the other fixture. Time per piece with this equipment was .117 minutes each and the operator was able to maintain continuous production at the rate of 450 pieces per hour.

GRINDING



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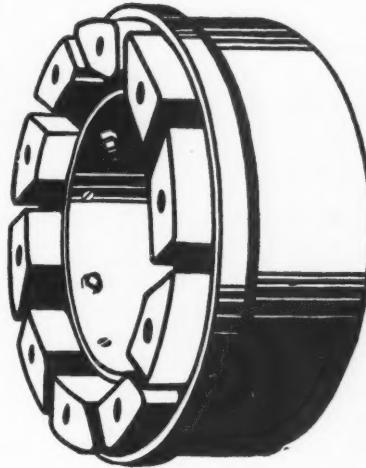
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BRIDGEPORT

Air pressure cylinders for clamping are used to great advantage with the equipment shown in Fig. 7, which was built to mill the counterweight seat on an eight-cylinder crankshaft. The shaft is shown diagrammatically by Fig. 8. This job presented some very unusual problems due to the interference of the throws and very close cutter clearances. It was required to mill five of these seats, spaced at intervals of 120 degrees. Consequently, for each cycle of the machine, the

machine cycle is quite complicated—so complicated in fact that a large fixed bed type machine such as this Cincinnati Hydromatic Miller would not ordinarily be considered the right machine for this kind of work. Extreme flexibility and ease of control serve, however, to make the application successful and profitable.

With the two crankshafts loaded into the fixture and the spindle carrier raised high enough so that the cutters will clear the throws of the

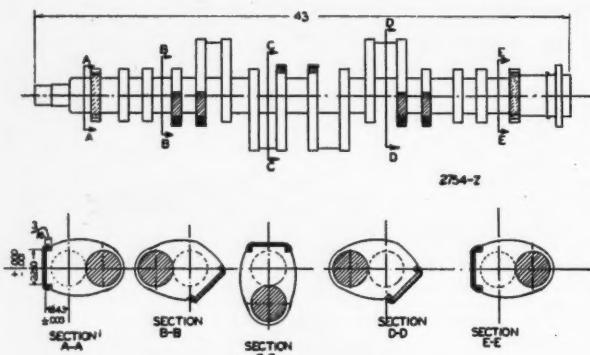


Fig. 8—Drawing of eight-cylinder engine crankshaft.

work had to be clamped and unclamped five times. Air cylinders performed this function almost instantaneously whereas any form of manual clamping would have greatly increased the production time, especially since the fixture holds two pieces.

The work is supported by a vee block under each of the main bearings and is clamped directly over each bearing. This locates a clamp close to the position of each cut. Clamps are actuated directly by the air pressure cylinders concealed in the base of the fixture, there being a separate cylinder for each clamp, or ten in all. One valve on the side of the fixture near the operating position actuates all ten cylinders simultaneously. The

operator then throws the drum switch on the side of the bed and the spindle carrier moves down under power. This power is applied by means of a torque motor mounted directly on the elevating bracket. Just as the cutters are about to enter the work, the down feed of the carrier is automatically stopped by means of a limit switch. The operator then feeds the spindle carrier down into the cut and against a positive stop by means of a large hand wheel at the side of the bed. The spindle carrier is clamped in place by means of the lever alongside of the overarm and the table feed is started by throwing the vertical lever at the

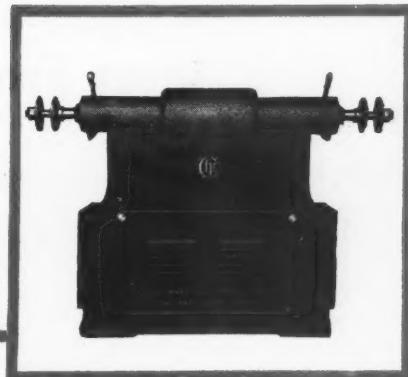
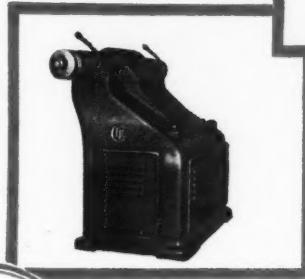
(Continued on page 66)

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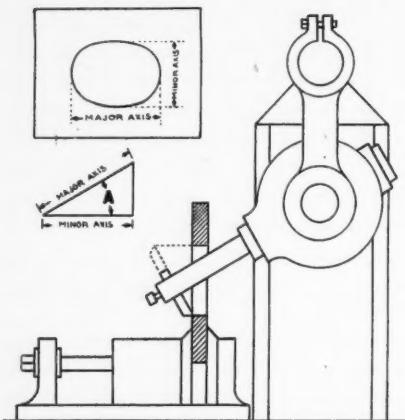
Ideas From Readers

This department is a clearing house for ideas. If there is a "kink" or short cut in use in your shop, send in a description of it. We will pay \$5 for each one published.

Boring Elliptical Holes

By CHARLES KUGLER

ELLIPTICAL holes with dimensions that come within certain limits can be bored on the milling machine by the use of a universal attachment, as shown in the illustration. The core should be removed from the hole as



By using a universal milling attachment as shown here, a perfect ellipse can be bored.

usual, leaving approximately $\frac{1}{8}$ in. all around to be removed by the boring tool. It is obvious that if the arm of the attachment were exactly horizontal, the cutter would bore a perfectly round hole. As the arm is swung from the horizontal toward the perpendicular, the vertical dimension of the hole is decreased while the horizontal dimension necessarily remains the same—which is the arc formed

by the point of the tool as it revolves. The problem is to determine the angle at which the arm should be set to bore an ellipse of the required dimensions.

The dimension of the minor axis should be divided by the dimension of the major axis, or:

$$\text{Cosine Angle A} = \frac{\text{Minor Axis}}{\text{Major Axis}}$$

The Cosine Angle A can be found in a table of natural cosines. This angle is the angle at which the arm should be set. If the minor axis is too small, the arm may strike the edge of the hole before the hole is completed, but such cases are in the minority. And even then, if the work is high enough above the table, the arm can be swung to the same angle above the table, the work raised, and the bottom of the hole completed.

In a recent case in which this method was used, the major axis of the hole was 3 in. and the minor axis was 2.525 in. Therefore, the Cosine Angle A was

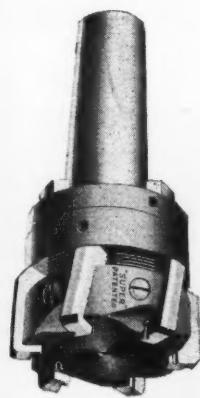
$$\frac{2.525}{3} = 0.840 \text{ in.}$$

In the table of Natural Cosines this figure equals the angle of 32 deg. 51 min. By setting the arm at this angle, a perfect ellipse of the dimensions required was bored.

Device for Cutting Drawing Paper and Cloth

By MORRIS A. HALL

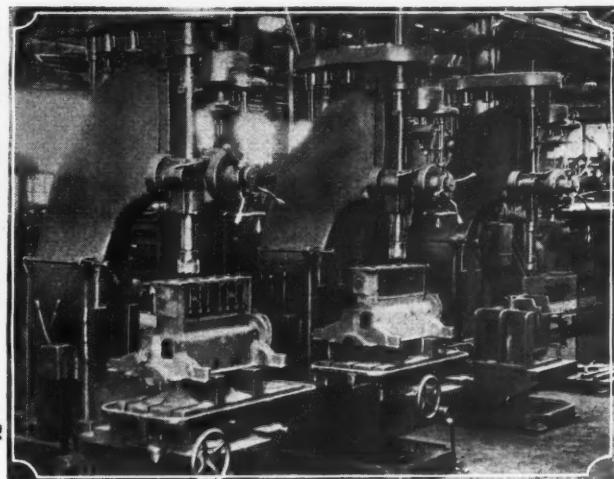
ORDINARILY, detail paper, drawing paper, and tracing cloth are hard to cut squarely and evenly. A



Line-up of machines equipped with McCrosky - SUPER Reamers for reaming tractor cylinders.

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that has to maintain the close accuracy



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Bulletin No. 12-A shows all styles of standard McCrosky - SUPER reamers and examples of special reamers and line bars made by McCrosky. Send for a copy.

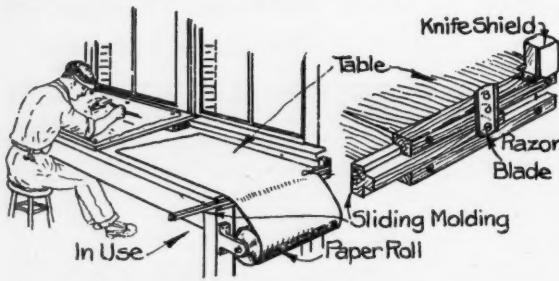


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great deal of material is wasted in the course of a year in the average drafting room because of uneven cutting.



Device for cutting tracing paper and cloth.

While the device shown does not aid the individual draftsman particularly, the firm is benefited sufficiently to warrant any chief draftsman or chief engineer having one made. With this device, the edge of the paper or cloth is cut squarely and exactly. It is simple of construction, consisting of a sliding molding on the end of the table, carrying a safety-razor blade that projects slightly so as to cut the paper or cloth in sliding across the end of the table.

Two lengths of $\frac{1}{2}$ -in. or $\frac{3}{8}$ -in. rabbeted molding are fastened to the end of the table, while another length, rabbeted on both sides and fitting into the rabbets of the other two, forms the slide. A razor blade is fastened to the rear end of the sliding piece in the position indicated so that it projects above the surface of the table from $\frac{1}{16}$ in. to $\frac{1}{8}$ in. The slide should be a trifle wider than the other pieces so that the blade will clear them. To use, the required amount of paper is drawn out on the table, then the molding is pulled out, the razor blade cutting

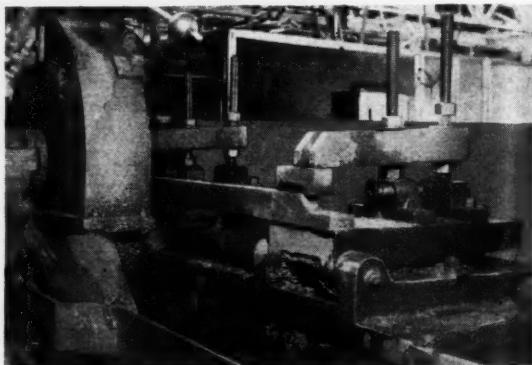
the paper off as it travels across the end of the table.

To avoid danger from the blade when not in use, the slide is pushed all the way in, in which position a small sheet metal box covers the blade. Setting the table against a wall provides a further safeguard. The saving made in the first year will more than pay the cost of making and installing this simple device.

Fixture for Grinding Flat Surfaces

By JOHN McCULLAGH

LOCOMOTIVE repair shop operations include a great deal of flat surface grinding on such parts as



Fixture for grinding flat surfaces.

guides of various sizes, and it is common practice to mount and clamp such parts directly on the table of the grinding machine. Wear on the table can be reduced and the work can be clamped much easier and quicker if a fixture such as the one shown in the illustration is used. This fix-



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ture was designed and built in a Western railroad shop.

The fixture consists of two units of similar design, each of which consists of an adjustable work-holding section hinged to a base that is anchored to the machine table. The work - holding section carries an adjustable clamp that can be arranged to hold work from $1\frac{1}{2}$ in. to 8 in. in height. Work held in the fixture can be ground square with either top or bottom surfaces, or, by raising the rear end of the work-holding section, any angle desired can be produced. The use of this fixture has not only simplified the clamping of work that is to be finished on the surface grinding machine, but it has also made possible the finishing of angular faces on work which previously required rather complicated set-ups.

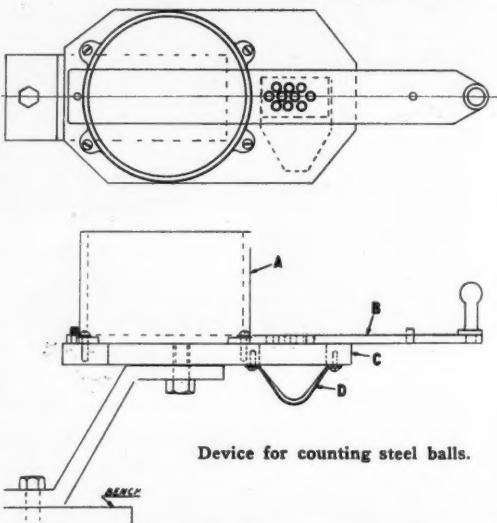
Device For Counting Steel Balls

By HARRY S. TAYLOR

THE device shown in the accompanying sketch was designed for use in counting steel balls as the balls and races were assembled to bicycle hubs. The balls were $\frac{1}{8}$ in. in diameter, and 10 balls were placed in each race. We employed girls in our assembling department, and had quite a little trouble in getting the girls to count the balls accurately. After this device was placed on the job, however, our troubles were over.

The device consists primarily of a round metal hopper A, mounted over a slide B which slides in a groove that has been milled for it in the base C. The base is mounted on an arm that is bolted to the work-bench. The slide

B is of the same thickness as the diameter of the balls, and contains 10 holes approximately $\frac{1}{8}$ in. larger than the diameter of the balls, each hole being countersunk at the top to facilitate



Device for counting steel balls.

tate loading. The hopper is filled with balls. The operator then pushes the slide B under the balls in the hopper, at which point the balls fall into the 10 holes. Upon pulling the slide out to the stop pin, the 10 balls fall through an aperture in the base and into the chute D, which conveys them to a hub that has previously been placed in position. The use of this device doubled production on this operation.

Sawing a Shaft Square

By R. H. KASPER

OCCASIONALLY it becomes necessary to cut a shaft, using a hacksaw and sawing by hand, without removing the shaft from the machine of which it is a part. Unless the cut is made reasonably square, the end of

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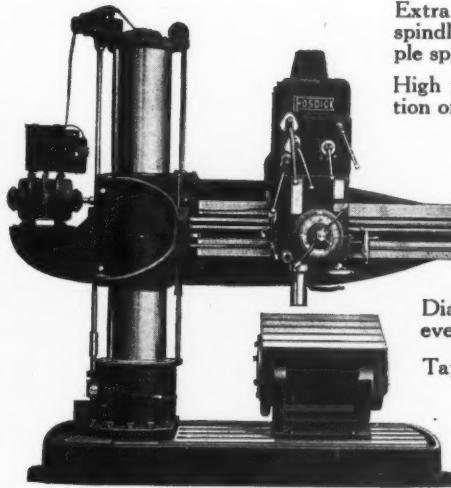
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the shaft will present an untidy and unworkmanlike appearance. If the shaft can be revolved, it is a simple matter to mark a line for the cut, but if the shaft cannot be revolved, it is a difficult task to mark a straight



A sheet of paper, wrapped around the shaft, serves as a guide to saw the shaft square.

line around the shaft. In such cases, a sheet of paper, wrapped around the shaft and tied in position, makes a perfect guide. If the paper is not wrapped straight, the edges of the paper will not meet, therefore, it is only necessary to see that the edges of the paper are parallel.

Air Clamping Fixtures

(Continued from page 58)

side of the bed near the forward end.

At the end of the cut the table is again automatically stopped by dogs, the operator unclamps the carrier and raises it by means of the drum switch. The vertical movement of the carrier is again stopped by a limit switch. The operator now indexes the work 120 degrees, throws the lever which starts the table forward again at rapid traverse, and the previously described cycle is repeated five times. When the cutters are raised out of the final cut, the table starts back at rapid traverse instead of again moving forward, and comes to rest at the loading position.

An interference plate is set on the side of the machine table next to the spindle carrier so that the carrier may not be brought down unless the table is in the proper position for milling. This is a safety feature designed to

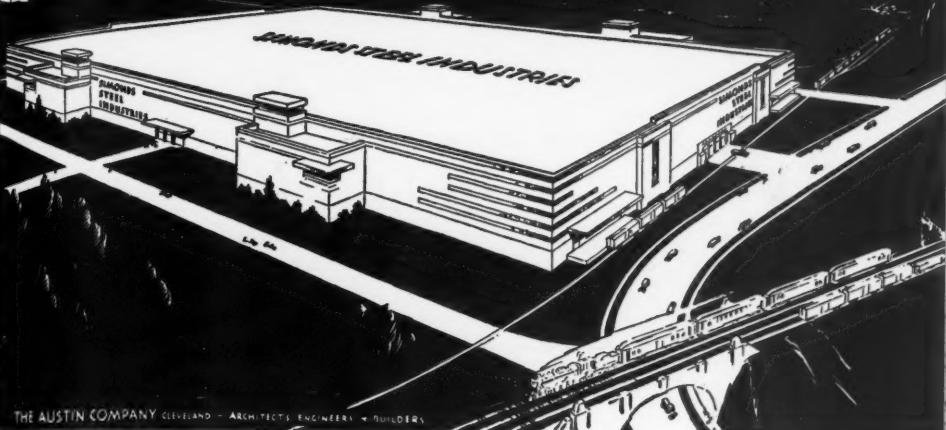
prevent a wreck which might be caused by bringing the cutters down into one of the throws of the crankshafts. The total floor to floor time per crankshaft for this operation is 4.9 minutes with a net hourly production of between 11 and 12 pieces, which is maintained continuously.

The examples given above point out two types of installations where the use of air clamping is particularly advantageous and economical. The largest use is in the field of extremely high production where small unit savings will show large total savings. The other is on that class of work where the clamping time can be greatly reduced by the use of air pressure cylinders. In this latter class production need not be extremely high, but must be large enough to warrant the additional investment in fixtures.

Societe Genevoise Issues Two New Catalogs

The R. Y. Ferner Co., 1127 Investment Bldg., Washington, D. C., is distributing two new catalogs that have been issued by the Societe Genevoise d' Instruments de Physique, of Geneva, Switzerland. Catalog No. 527 describes a new model of Swiss High Speed Precision Borer, Type MP-30, which has been designed for handling small work such as laying out, drilling, and boring holes in dies and instrument parts. The machine operates at high speeds suitable for small holes and has power for boring holes up to 2½ in. diameter. The nominal capacity includes work up to 18 x 12 x 14 in. high.

Catalog No. 518 illustrates and describes a form of heavy support for measurements and inspection work by means of the Societe Genevoise Micro-Indicator. A wide variety of parts may be tested with this apparatus, including the inner as well as the outer diameter of rings and ball races, the diameters of cylindrical parts, and dimensions of flat pieces. A T-slotted table makes possible the attachment of special fixtures for the support of odd-shaped pieces to be inspected.



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In order that our readers may visualize the new Simonds Windowless Factory for themselves we present at the top of this page an illustration taken from the architect's drawing. This illustration gives a general idea as to how this most modern of industrial buildings will look when completed. Men are now at work preparing the enormous expanse of ground for the foundation of this gigantic plant. Satisfactory progress is being made and everything points to the completion of the building within the prescribed time. Follow the progress of this project. It's a Simonds' contribution to the plan toward creating better business conditions.

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Faster cutting files for industrial use, and longer-wearing qualities are features of Simonds Files that appeal to men who work in metal. Test out a Simonds File. Observe how it "takes hold" and removes more metal faster. It does this longer without showing wear.

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The finish obtained was regarded as the best they have ever had. Electrolon K Bond wheels are now the standard.

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Over the Editor's Desk

1931

THREE is hardly need to *wish* our readers a "Happy and Prosperous New Year"—it will be. We have no desire to become one of the professional business prognosticators—we sometimes think there are too many as it is—but every indication supports our first statement. True, business is still pretty sick and is gaining strength so slowly that it seems, sometimes, as though the matter of selecting the undertaker and making arrangements for the flowers might well proceed. But the last few weeks have seen a decided turn for the better and there is no question now but that business is recovering at a constantly-increasing rate of speed. Momentum may be retarded somewhat by conditions in foreign countries, but by summer—or autumn at latest—the industrial wheels of the U. S. A. will be spinning merrily.

The economic condition of the country as a whole has been pretty bad, but this condition can undoubtedly be given credit for a considerable amount of education, and for important developments in the relations between employers and employees. Bitter denunciations have been flung at "soulless corporations" in past years, and the bigger the corporations, the more bitter the criticisms. During the last twelve months these same corporations have assumed a large measure of responsibility for the welfare of their employees, and a number of the largest industrial units have inaugurated unemployment fund plans and other relief measures which have cut into their reserve funds by amounts of no small magnitude. The best thing that has come out of the situation is an awakening to the fact that the community—and the nation—prospers or suffers with the individual, and that if the individual can be provided with steady employment so that he and his family can prosper, all the rest of the community will prosper as well.

So-called "buyers' strikes" are beyond control; what the individual does with his money is a matter to be decided by no one but himself, but this particular contribution to the general economic depression comes only as a result of fear that has been instilled by the breaking-down of other parts of our economic structure. In the past such failures have been caused by lack of proper co-ordination of the banking system, by tightening of the money-market by those in control, by collapse of superficial price-structures, and by deflation of bloated stock prices. The first two of these factors have been permanently eliminated; it stands to reason that if the others can be prevented, two more important steps will have been taken toward the solution of the nation's most important problem. This matter is now the subject of more intensive study than ever before; perhaps by the time another "business cycle" has rolled around, means will have been found to prevent a repetition of the condition that has prevailed throughout the past year.

New Shop Equipment

Cincinnati Hypro Openside Planer

The Cincinnati Hypro Openside Planer which has been placed on the market by The Cincinnati Planer Company, 3100 South Street, Cincinnati, Ohio, has a number of features which make it particularly adaptable for use with the

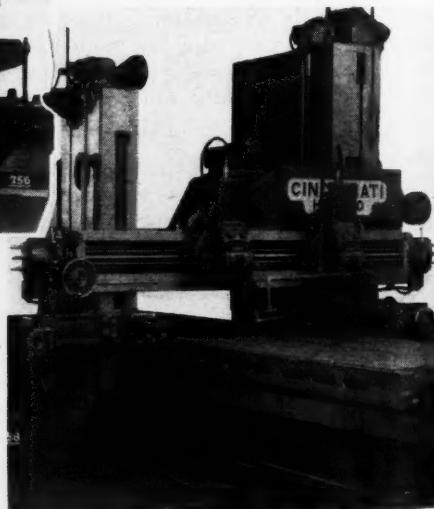
On the open side, the rail and knee are clamped to the column through an electric clamp that is operated by a torque motor, a push button being provided at the end of the rail to control the clamping and unclamping operations. The raising and lowering of the rail and the rapid traversing of the rail and side heads are also controlled through push buttons.

The left hand housing is an auxiliary housing to provide a fourth head, and the entire housing and head can be removed in a few minutes when a piece of work that is wider than the table is to be machined. As the small motor for rapid traversing the fourth head is carried on this housing, the housing can be removed without changing or disturbing any connections.

The belt-shifting device is of special design and will operate to deliver a stroke as short as $1\frac{1}{2}$ in. to 2 in., depending on the type of reversing motor used. This arrange-



(Above) — Cincinnati Hypro Openside Planer with chain hoist in position for quick removal of auxiliary housing. (Right) — View of left side of planer, showing dual control on left end of rail, also trough under table for returning coolant to pump.



modern tungsten carbide tools. The machine is operated completely through push button control, the buttons which control the operation of the motors being arranged on a block that is suspended over the table, convenient to the operating position.

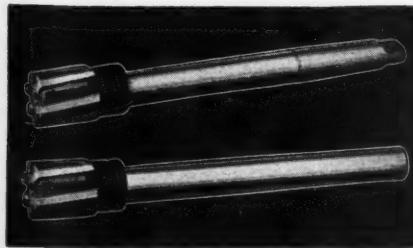


ADJUSTABLE REAMERS

The makers of each Wetmore Reamer take pride in its perfection. They are guided by the thought that each reamer, when completed, will be used by the kind of men who take pride in *their* work. That is one of the reasons why Wetmore, for many years, has been known throughout industry as "The Better Reamer".

Write for latest catalog of all types of Wetmore Machine and Cylinder Reamers and replacement blades.

WETMORE REAMER COMPANY
414 No. 27th Street Milwaukee, Wisconsin



WETMORE TYPE NO. 11 HEAVY-DUTY REAMERS

With straight or taper arbor integral. Combines all the advantages of both solid and adjustable reamers. Left-hand angle blades prevent "digging in", chattering, and scoring by the reamer while backing out. The $\frac{1}{8}$ " projection of blades over end of reamer body allows chips to fall off ahead of reamer, so that they do not clog up along cutting edge of blades. Wide range of adjustment provides for wear and regrinding. Sizes range from 1" to 3", inclusive.

ment has many advantages, especially when machining in close quarters inside of a casting.

When tungsten carbide tools are used, it is essential that the tool clear the work on the return stroke. This necessity is provided for by pneumatic tool lifters, attached to each head, which raise the tools on the return stroke. The tool lifter can be used simultaneously on all heads or on any one head if desired. The device is without any projecting parts or lugs that might interfere with work in close quarters. The moving parts are all hardened and ground to provide for long life.

Provision is made for supplying coolant to the tools, the coolant system being arranged so that the coolant drains to the left side of the table and then through a short pipe to a steel trough which, in turn, drains into a tank at the rear of the left housing where the small pump and motor are located. The piping for the coolant is fitted with universal joints to accommodate all positions of tools.

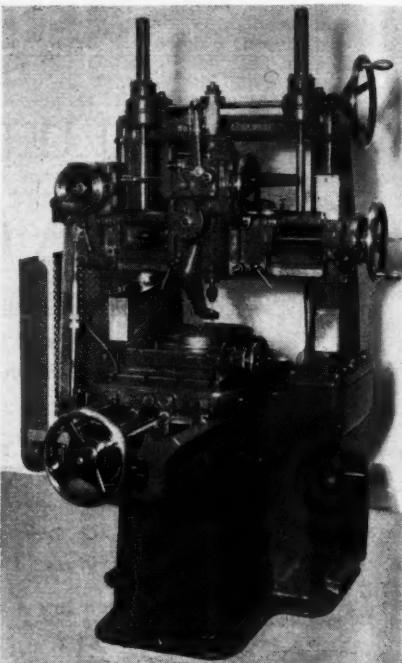
A built-in device, controlled by a hand wheel at the left of the rail, is provided for use in rack cutting and spacing. Small dogs between the regular shifter dogs provide for speeding up the table on gaps between pieces or sections of parts in process. The small belted unit on the right side of the column is an electric speedometer which constantly registers the speed of the table for both cut and return on a dial at the control panel.

Swiss Model MP-3C Jig Boring Machine

The illustration shows the new Model MP-3C Jig Boring Machine, made by The Societe Genevoise d'Instruments de Physique of Geneva, Switzerland, and marketed in America through their American agents, The R. Y. Ferner Co., Investment Bldg., Washington, D. C. The machine is similar to other sizes of Swiss Jig Borers in that the boring head is mounted on a slide which moves horizontally on a cross rail, supported by two upright housings, while vertical movement of the rail is obtained by two vertical screws. Accurate measurements are also obtained by the use of micrometer lead screws for moving the boring head and table.

Any small errors which may remain

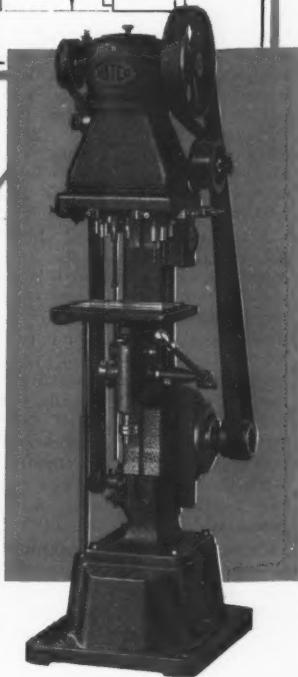
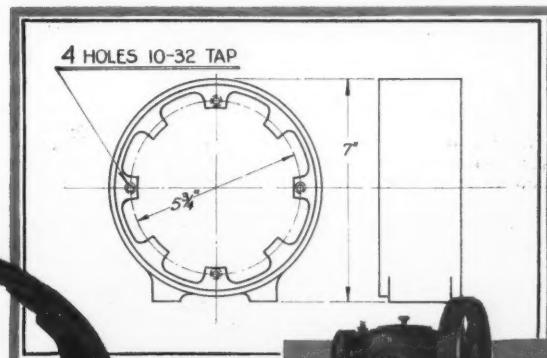
in the lead screws after lapping are compensated for by the use of curved templets attached to the table and cross slide. A somewhat different system is used, however, for transmitting these corrections to the vernier indexes of the micrometer heads. Through this templet and lever system the errors are trans-



Swiss Model MP-3C Jig Boring Machine

ferred to the micrometer index, shifting the latter slightly back and forth to place it in the correct position to allow for the errors at any point on the screw. This method is so accurate that the manufacturers guarantee the setting for all displacements of the table and boring head slide to be correct within 0.0002 in. plus or minus.

The table is 15 x 20½ in., and the free distance between the vertical uprights is 23¾ in., nearly twice the transverse motion of the boring head, which is 12 in. The table can be moved through 18 inches so that holes can be located, drilled and bored anywhere within an



600 MOTOR FRAMES TAPPED EVERY HOUR—

Shown above is one of the small cast iron motor frames which are being tapped at the rate of 600 an hour—one piece every six seconds. Four 10-32 holes are tapped in each piece—a total of 2400 good clean threads every hour on the NATCO Model C-5 Adjustable Multiple Spindle Driller shown at the right. It may be operated with either hand or foot feed and its great flexibility makes possible its use on a large variety of small work.



Send for a copy of our circular covering this machine or send in your prints for our recommendations.

"NATCO Solves Your 'Hole' Problem"

THE NATIONAL AUTOMATIC TOOL CO.
RICHMOND, INDIANA, U.S.A.

area of $1 \times 1\frac{1}{2}$ feet without resetting the work. The vertical travel of the cross beam is $9\frac{1}{2}$ in., which, with a minimum distance from table to cross rail of 5 in., gives a maximum vertical capacity of $14\frac{1}{2}$ inches.

The machine is driven by a 1-h.p. 2-speed motor attached to the rear of the machine so that with a 4-speed gear box it is possible to obtain 8 speeds of the spindle varying from 135 to 1,500 r.p.m. Thus the machine is suitable for drilling very small holes as well as for drilling in cast iron up to 1 in. and boring up to $2\frac{1}{4}$ in. Two rates of power feed for the spindle are provided—0.004 and 0.008 in. per rev. The hand feed of the spindle is 0.100 in. per rev. of the hand wheel. The lead screws have 5 threads per in. The micrometer head is divided into 400 divisions so that each division is 0.0005 in. and verniers for each micrometer head read to 0.00005 inch.

A circular table of 13 $\frac{1}{4}$ in. diameter and $4\frac{1}{8}$ in. high can be furnished if desired. The drum on the worm screw of the table is graduated to 30-second intervals, and by using the vernier, the angular settings can be read to 5 seconds of arc. The accuracy of the circular table, therefore, corresponds very closely with that of the settings of the rectangular table and cross slide.

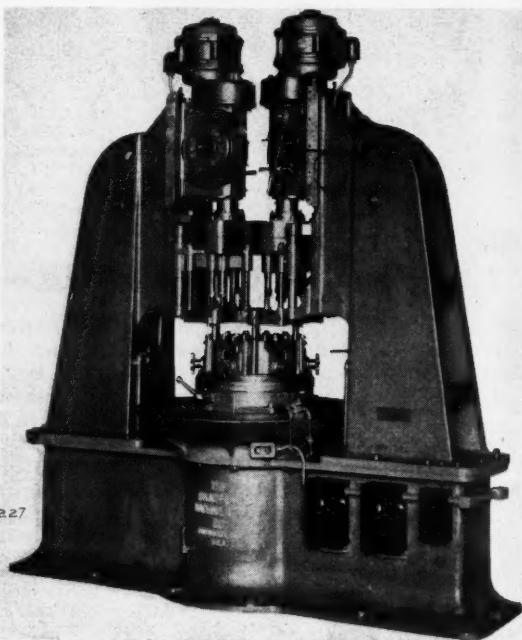
Other accessories include a centerpoint for the spindle, used in tapping holes straight. A locating microscope and reference square are also supplied to aid in placing the axis of the spindle exactly over the edge of a job or for sighting on any specified point. An adjustable boring tool of $2\frac{1}{4}$ in. capacity is also supplied with the standard accessories, as well as two guide bushings for drilling and reaming $\frac{1}{2}$ -in. holes, also an endless belt and a set of service wrenches.

The machine is 6 ft. 4 in. high, has an overall length of 58 in. and a width of 51 in., and weighs 2,150 pounds.

Bradford Two-Head Drilling and Reaming Machine

The illustration shows a two-head machine that has been developed by The Bradford Machine Tool Co., 659 Evans St., Cincinnati, Ohio, for use in machining the pump bearing plate for an electric refrigerator. The tooling equipment consists of a series of six work-holding fixtures, mounted on a hand-operated turret. The fixtures work in conjunction with the cluster boxes and slideable bushing plates mounted on the drill heads. The bushing plates register on four indexing pins at each cycle of the machine, thereby insuring perfect alignment.

The machine is arranged so that while the work is being changed at the first



Bradford Two-Head Drilling and Reaming Machine.

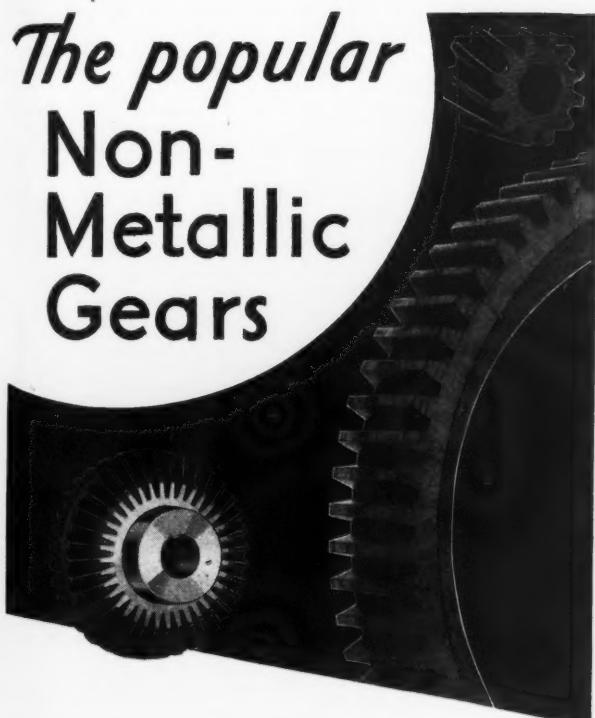
station of the machine, two 8-32 in. holes and two 17-64 in. holes are being drilled at the second station, one 0.180 in. hole and one 23-64 in. hole are being drilled and two 17-64 in. holes are being countersunk at the third station, six

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The popular Non-Metallic Gears



FORMICA gears are the most popular silent gears. Every year American industry has used more and more of them, and this steady preference, always growing, has brought a great many of them into use.

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Joaquin Alvarado Lopez
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Dubuque Foundry & Mfg. Co.
Dubuque, Iowa

The Generating Gear Co.
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Mobile Power & Machine
Mobile, Ala.

Berkeley Metal Works &
Tool Company
Norfolk, Va.

E. M. Smith Machine Shop
Pittsburgh, Pa.

The Earle Gear & Mfg. Co.
Philadelphia, Pa.

The Pittsburgh Machine &
Supply Company
Pittsburgh, Pa.

Standard Gear Co.
Pittsburgh, Pa.

Rodney Davis and Sons
Philadelphia, Pa.

The Turner Gear & Mfg. Co.
Newark, Del.

Wingfield H. Smith, Inc.
Springfield, N. Y.

Alling Lumber Company
Albion, N. Y.

Charles E. Crockett Gear
South Elgin, Ill.

Arlington Machine Co.
St. Paul, Minn.

Warren Gear Works
Worcester, Mass.

Massachusetts Gear & Tool
Co.
Woburn, Mass.

0.332 in. holes are being drilled at the fifth station, and one $\frac{1}{8}$ in. hole is being drilled while one 0.186 in. and one 0.375 in. hole are being reamed at the sixth station. All holes are located on a 2 25-64 in. diameter center.

The material is a steel forging and the holes are drilled through the flange, which is $\frac{3}{4}$ in. thick. The drill heads are the Bradford standard automatic units with independent motor drive and cam feed. The control of the feed mechanism is obtained through the hand valve, mounted at the right front of the machine. This valve connects air-operated trip units attached to the tripping units of both heads, causing both spindles to operate simultaneously.

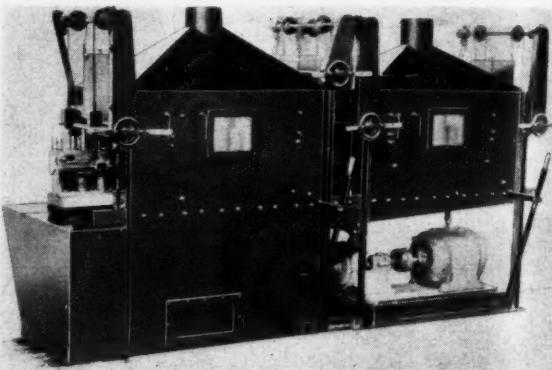
A push button is provided for the control of the entire machine. Individual switches with overload protection are provided for each motor, and a magnetic switch provides under-voltage protection. The machine can readily be adapted for general production work by changing the tooling equipment and the multiple spindle cluster boxes.

Ransohoff Parts Cleaning Machine

The illustration shows a cleaning machine that was developed by N. Ransohoff, Inc., 400 W. Seventy-first St., Cincinnati, Ohio, to clean cylinder blocks before final assembly in one of the Detroit automobile plants. The block reaches the cleaning machine riding on a wood pallet on a roller conveyor, and enters a vapor-tight chamber where it encounters an automatic stop. At this point the cylinder is sprayed, inside and out, with Oleum spirits from a battery of nozzles which are so arranged as to register accurately with the valve holes and cylinder bores. The solvent loosens the grease, oil, dirt, chips and other foreign matter.

The block then travels into the next compartment, where a second series of

nozzles, similarly placed, sprays the casting with air under high pressure, removing the loosened dirt and such excess solvent as may remain in pockets in the casting. The nozzles are so mounted that the simple pull of a lever re-positions the nozzle assembly to register with a different size cylinder block.



Ransohoff Parts Cleaning Machine.

Thus two sizes of blocks can be handled by the machine without change of equipment.

The cleaning spirits are circulated under 35 lb. pressure by a direct motor-driven centrifugal pump. As the spirits are valuable, a distillation system has been provided so that the contaminated spirits may be run through a still and all grease, oil, dirt, chips, iron rust, and abrasive materials removed. Distillation is accomplished at a low cost per gallon. Loss due to evaporation in the machine is negligible due to the vapor-tight chamber.

Campbell Abrasive Cut-Off Machine

Andrew C. Campbell, Inc., Waterbury, Conn., has brought out an abrasive cut-off machine for use in cutting steel, steel alloys, iron, non-ferrous metals, fibre, and similar materials. It is said that the machine is unusually fast, and that the cuts made by the use of this machine are smooth and true. The material is not damaged by the heat, and there is no danger of drawing the tem-

A NEW IDEA

that saves you money



The sectional view shows the small diamonds mounted in line. After the first diamond is worn away in use the metal is simply turned or ground away to expose the next one. Koebel Multi-Set Diamond Dressers are made in three-set, four-set and five-set types in various sizes to meet all wheel dressing requirements.

The KOEBEL Multi-Set Diamond Dresser is a new idea in the way of diamond dressers—radically different, yet, extremely practical and economical.

Instead of using one large diamond which must be remounted time and time again—the KOEBEL Multi-Set Diamond Dresser has several small, tested, quality diamonds mounted in one tool. The KOEBEL Method (Patents Pending) of entirely surrounding the diamonds with a newly developed metal insures a mounting that holds the Diamond rigidly in place and protects against loss until it is completely used up.

This new idea saves you money because KOEBEL Multi-Set Tools cost less, eliminate re-setting charges, reduce handling costs and lower loss from unintentional abuse. Get the whole story—send for illustrated folder and price list.

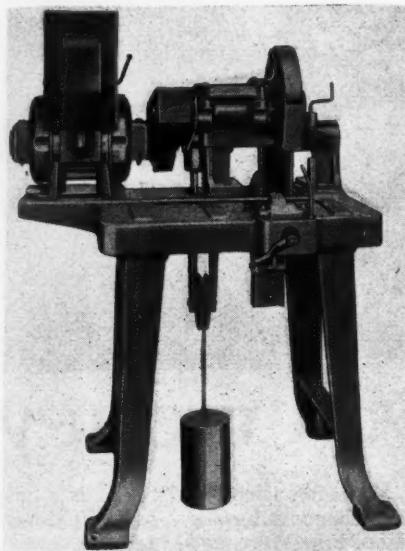
KOEBEL-WAGNER DIAMOND CORP.
144 Orange Street, Newark, N. J.
Detroit Indianapolis Chicago
Cleveland New York

KOEBEL

Multi-Set Diamond Dressers

per of any material during the cutting process.

The machine is designed for safety and utility, the handle by which the disc is



Campbell Abrasive Cut-Off Machine.

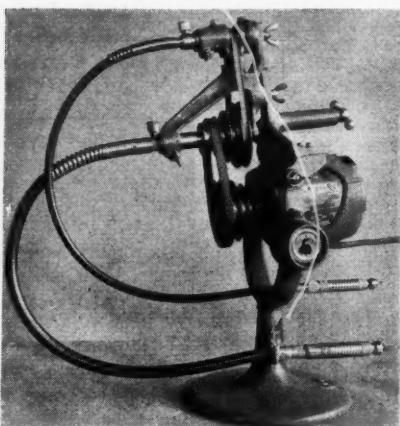
operated being arranged so that the operator may use either hand. The starting switch is conveniently located, and the belts and discs are guarded to prevent the possibility of injury to the operator. All moving parts are perfectly balanced so that a minimum of effort is required to operate the machine. The motor is rigidly fastened to the bed of the machine and is not a part of the counterbalancing arrangement. This construction is said to result in smoother operation and also permits the use of a motor of the most efficient size to suit the requirements of the job.

The bed of the machine is large, and is provided with finished foot pads for use in attaching fixtures for special production jobs. Fixtures to suit any requirements can be furnished with the machine, although the standard equipment is calculated to take care of most needs. A positive V-belt from the motor to the disc driving pulley provides for a smooth, positive delivery of power.

Keller Two-Shaft Flexible Shaft Machine

The Keller Mechanical Engineering Corporation, 84 Front St., Brooklyn, N.Y., has brought out a flexible shaft machine with two shafts, which makes possible a much higher range of speeds than has been possible with a single machine heretofore. The first shaft operates at four speeds, ranging from 875 to 3,500 r.p.m., and is intended for use with tools with shanks of from $\frac{1}{16}$ in. to $\frac{1}{4}$ in. The second shaft, which is the upper and lighter shaft, is for high speed work and operates at from 5,250 to 10,000 r.p.m. The comparative light weight and high speed of the upper shaft make it ideal for use on delicate work and for driving small burs and grinding stones.

The light shaft assembly may be attached to any "Kellerflex" machine with four speed pulleys, thereby doubling its usefulness. The high speed drive can be added simply by changing the over-arm for one that carries a small pulley mounted on ball bearings. As the high speed shaft is intended for use on the finer operations, the shaft is lighter and more flexible. To release the strain on the shaft, slots are milled on the motor bracket so that the whole unit may be moved until the balance point is found. This arrangement facilitates easy swiv-



Keller Two-Shaft Flexible Shaft Machine.

eling and relieves the shaft of undue strain, as the machine is balanced in all positions.

To accommodate the shaft and smaller

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DEPENDABLE POWER

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"LOGAN"

AIR CYLINDERS

PRODUCTION MEN throughout industry will tell you that the efficient operation of air operated chucks, vises, etc., depends upon the power of the cylinder used on these devices. The air cylinder **must** transmit plenty of power to the device to hold work under the heaviest cut and fastest speed.

"LOGAN" Air Cylinders have many features which assure you of such dependable power. Some of these features are:

Enlarged Air Inlet and Outlet—for quick operation.

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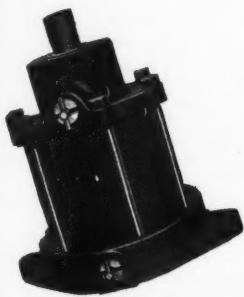
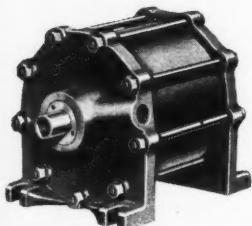
There's a "LOGAN" Air Cylinder to solve every problem—five standard models rotating type 1-1/2" to 20" diameter bore and seven standard models non-rotating type 1-1/2" to 16" Diameter Bore. Special types to meet special requirements.

SEND FOR CATALOG S-25

THE LOGANSPORT MACHINE COMPANY

LOGANSPORT, INDIANA

Designers and manufacturers of Air-operated devices for every work holding requirement as well as many other purposes.



grinding stones, a new, smaller hand piece has been made, which is of lighter construction, but is strong and rigid with no play in the spindle, due to self-adjusting ball bearings. The outside diameter of the hand piece is $\frac{3}{4}$ in., which is an ideal size to hold in the fingers on hand work. Felt washers protect the ball bearings, and both protect the bearings from dirt and prevent the oil from running out.

The large shaft may be left on the machine for coarser work, permitting the operator to change from one to the other with no loss of time. The small shaft may also be used on a jack shaft pulley, where it is desirable to use small burs and rasps at speeds varying from 875 to 3,500 r.p.m. Another innovation is a 10-ft. shaft and $\frac{1}{2}$ -in. diameter sheath, designed so that it will run without chattering or vibration, thereby eliminating any loss of power in driving the tools. Here again the new hand-piece is used, and, by means of interchangeable spring collets, burs or grinding stones may be used with shaft diameters varying from $\frac{1}{16}$ in. to $\frac{1}{8}$ inch.

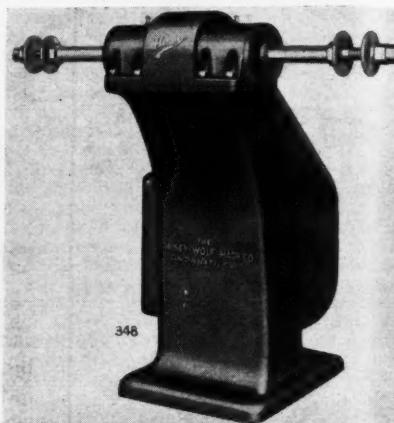
"Hisey" Model M Texdrive Buffer

The "Hisey" Model M Texdrive Buffer and Polisher, shown in the illustration, is designed to meet the demand for an efficient polishing machine that will occupy a minimum of floor space. The gooseneck construction of this machine allows the spindle and buffing wheels to extend toward the front to a point that is directly over the front edge of the base, permitting easy handling of large or odd-shaped work. The operator is also enabled to stand or sit close to the machine, where the nature of the work permits.

The motor mounting is of the external type with a rigid four-point support, which is intended to preclude the possibility of inexperienced operators adjusting belts too tightly. The motor is ball bearing equipped, and is mounted on a dove-tailed sliding base with a gib and locking screws. Proper belt tension and accurate alignment of the motor are easily obtained. The spindle speeds are quickly and easily changed by changing the motor pulley, using the same drive. It is unnecessary to pull the spindle through the bearing housings.

The spindle is extra large and is of nickel steel, accurately machined and perfectly balanced. Flat-top threads af-

ford the maximum of security in holding the buffing wheels in place. A safety wheel nut of Tobin bronze is provided to protect the threads. Ball bearings of ample size carry the spindle, and



"Hisey" Model M Texdrive Buffer.

labyrinth seals keep the dust out of the bearings. The bearing boxes are keyed to the column, insuring perfect re-alignment after the boxes have been removed. The Texrope Drive insures perfect power transmission without slippage.

Ex-Cell-O Drilling, Reaming, and Tapping Machine

The machine shown in the illustration was built by the Krueger Division of the Ex-Cell-O Aircraft & Tool Corporation, 1250 Oakman Blvd., Detroit, Michigan, to perform all operations from drilling to tapping complete the holes in the end flanges of a rear axle housing that is approximately 66 in. long. The machine consists primarily of four groups of spindles contained in two semi-automatic units, one of which handles the drilling and step-reaming operations while the other unit taps the holes.

The first unit consists of a 20-spindle multiple head which is provided with two horizontal rack guide bars with equalizing pistons and shaft that serve to eliminate the possibility of misalignment of the unit. The head carries three banks of spindles, drilling eight 27-64

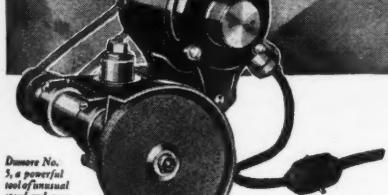
(Continued on page 86)

Diameter
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An Average of \$54⁰⁰ Saved Each Day

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Dumore No. 5, a powerful tool of unusual speed and accuracy, will cut
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pulleys . . . automatic belt tension . . . precision to
.0001" . . . spindle speeds of 3,600 to 35,000 R.P.M.

THE DUMORE COMPANY
28 Sixteenth Street, Racine, Wis.
Please send details of the new No. 5 Dumore
together with a free copy of "Precision Grinding".

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CARDON A C Tubes, manufactured by the Cardon Phonocraft Corp., Jackson, Mich., utilize an insulator made of English quartz, imported at great expense. Many methods used to cut this quartz tubing into 1 1/2 inch lengths proved wasteful and costly.

A Dumore No. 5 was then purchased, after tests proved it could drive a special 4" x .015" cutting wheel at 20,000 r. p. m., without vibration. This produced a clean uniform cut, increasing production and materially reducing wastage.

Now actual shop figures reveal that the Dumore is saving 30 feet of quartz per 1000 Cardon Tubes produced. This averages a high daily saving of \$54.00, whereby the Dumore pays for itself in a few days.

"Precision Grinding", a booklet containing a wealth of valuable grinding facts and illustrations of Dumore Grinders applied to unusual operations, will prove Dumore value to you.

THE DUMORE COMPANY
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Racine, Wisconsin

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47 Inquiries

SHELDON MACHINE COMPANY
MANUFACTURERS OF
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Modern Machine Shop,
128 Opera Place,
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Gentlemen:

We are inclosing herewith O.K'd. proof copy
of our 11" Lathe ad for your December issue.

In regard to our announcement ad covering this
pleased to know that we received forty-seven inquiries
directly traceable to this ad.

We feel this is an exceptionally good response
and want to again confirm what we have told you in the
past, i.e., we are very much pleased with our Modern
Machine Shop advertising.

Yours very truly,
SHELDON MACHINE COMPANY
BY *R.S. Dean*

EDC

November, 1930

Modern Machine Shop

Announcing...

The
SHELDON
11-in. Lathe

Formerly "Modern Jr." built by
Marshall Machine Tool Co.

No longer is it necessary to do
the small lathe jobs on large
tools... nor if you have a
SHELDON 11" Lathe. This
lathe is built to close precision
limits and will perform accu-
rately the same functions as
the larger lathe.

It is furnished in 3-ft., 4-ft.
and 5-ft. bed lengths with
either full-quick change gear
attachment or semi-quick
change gear attachment; cone
drive or individual motor
drive. And, the price is
right—see for yourself.

	CONE DRIVE		MOTOR DRIVE*	
	On Bench Legs	On Floor Legs	On Bench Legs	On Floor Legs
11" x 3"	\$325.00	\$340.00	\$405.00	\$410.00
11" x 4"	325.00	340.00	418.00	420.00
11" x 5"	345.00	350.00	425.00	430.00

*Includes 1/2 H.P. Motor and Starter

Sheldon Machine Co.
3283-55 Cottage Grove Ave.
CHICAGO, ILLINOIS

From This Ad

Modern Machine Shop Advertisers
Continue To Get Results!

Read the Letter!

THE trend among "careful buyers of advertising today" is to seek out ways of making their advertising dollar go farther than ever before. Quite a large number of these careful space buyers make their appearance in this number. They are listed below.

B. C. Ames Co.	Landis Tool Company
Carpenter Steel Co.	R. K. LeBlond Mach. Tool Co.
Cincinnati Electrical Tool Co.	O. K. Tool Co., Inc.
Federal Products Corp.	Pratt & Whitney Co.
Gairing Tool Company	Safety Belt Lacer Company
General Radial Drill Co.	Springfield Machine Tool Co.
George Gorton Machine Co.	S. S. White Dental Mfg. Co.
Landis Machine Company	

These companies spend their advertising money wisely!
Why don't you investigate this splendid sales-building service?

MODERN
Machine Shop

*More than 28,000 circulation
covering 22,000 plants*

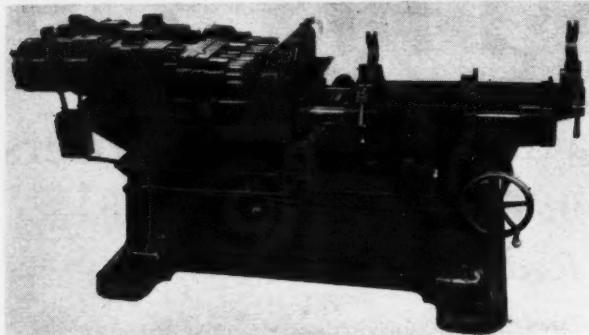
128 OPERA PLACE

CINCINNATI, OHIO

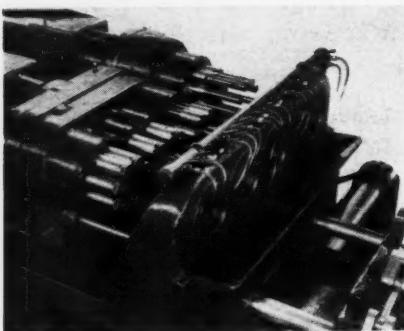
New Shop Equipment

(Continued from page 82)

in. holes and four 29-64 in. holes and step reaming eight $\frac{1}{2}$ -in. holes $\frac{1}{8}$ in.



310 Ex-Cello-O Drilling, Reaming, and Tapping Machine.



View of Multiple Heads with Bushing Plates and Fixtures.

deep while eight $\frac{1}{8}$ -in. holes are drilled entirely through the part. The eight-

spindle tapping head taps eight $\frac{1}{2}$ -in. 20 P. holes in one operation.

This piece is located in two Vees on a compound indexing table, where it is clamped by an adjustable cam clamping arrangement. A central equalizing interrupter is provided so that the piece can be tilted to the proper angle when drilling either end. When ready to operate, the table is moved to the left to drilling position where it is held by a jig lock connected to the operating handle. The operation is started by pressing a control button, and after the drilling cycle is completed, the machine

stops. The piece is then indexed to the second position. A separate control is provided for each unit. A large chip chute is provided to carry off the chips, and a manifold with individual nozzles provides for spraying each cutting tool with coolant.

Gairing Adjustable Inserted-Blade Hollow Mill

A hollow mill with inserted blades that can be adjusted to meet the requirements of the job has been placed on the market by The Gairing Tool Co., E. Lafayette Blvd., Detroit, Michigan. The tool is intended for use in machining bar stock, castings, or forgings, and is of unusually rigid construction so as to handle heavy work as well as light cuts. It is a com-

ALTO Tapping Machines
are built in three sizes
for all requirements.



The No. 1 ALTO Motor Driven Tapping Machine

is a small, compact, high-speed tapping unit for small tapping up to $3/16$ " in brass and $\frac{1}{2}$ " in steel. The speedy reverse—three times as fast as the forward speed—assures increased production.

Write for Bulletins!

ALTO MFG. CO., 1648-52 Wolfram St., Chicago, Ill.

The SHELDON 11-in. Lathe



Saves Power—Cuts Costs!

WOULD you use a 15 h. p. motor to run a 3 h. p. job? Of course not—the wasted power would be too expensive!

But, that is exactly what you are doing when you put a small lathe job on a large tool—wasting power and running up your costs! Eliminate this waste—install a SHELDON 11" lathe.

This lathe is built to close precision limits and will perform *accurately* the

same functions as larger lathes. It is furnished in 3-ft., 4-ft., and 5-ft. bed lengths with either full-quick change gear attachment or semi-quick change gear attachment, cone or individual motor drive.

You can't afford to overlook the possibilities of the SHELDON 11" Lathe in your shop—investigate its advantages! Send for an illustrated bulletin!

	CONE DRIVE		MOTOR DRIVE*	
	On Bench Legs	On Floor Legs	On Bench Legs	On Floor Legs
11" x 3'	\$325.00	\$330.00	\$405.00	\$410.00
11" x 4'	335.00	340.00	415.00	420.00
11" x 5'	345.00	350.00	425.00	430.00

*Includes $\frac{1}{4}$ H. P. Motor and Starter

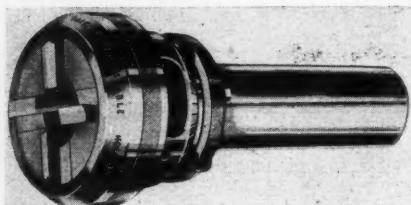
Sheldon Machine Co.

3253-55 Cottage Grove Ave.

CHICAGO, ILLINOIS

bination tool, for hollow milling and facing.

The outstanding feature of the tool is the simplicity of adjustment, which



Gairing Adjustable Inserted-Blade Hollow Mill.

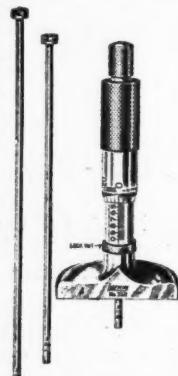
is accomplished by simply rotating the cone-shaped external nut. This nut has a bearing on the outer edges of the blades, and is graduated in thousandths of an inch for accuracy in setting. The blades are locked securely in the body of the tool and are of such construction that tilting is impossible. The blades are interchangeable; new blades are inserted when original sets are worn out from continuous grinding. Both are case-hardened to insure long life.

In the design of this tool refinements in design and accuracy of blade setting are combined with sufficient strength so that tungsten carbide tools can be used. Correct cutting angles for the blades and proper spacing for all kinds of metals have been incorporated in the design of the mill. Blades can be formed or ground to any angle. The body of the mill can be made for multiple cuts, or equipped with drills, reamers, or multiple operation cutters. Pilots can also be inserted in the mill for facing and

spotfacing operations. The mill is adaptable to a wide variety of work and is made in eight sizes for machining diameters from $\frac{1}{8}$ in. to 2 in. It can, however, be made to any diameter and for any number of blades on special order. Morse Taper or straight shanks are optional.

Lufkin Micrometer Depth Gage With Half Round Base

A micrometer depth gage with a base of half-round design has been announced by the Lufkin Rule Co., Saginaw, Michigan. The perfect balance of this tool allows it to be placed at the edge of the work and the larger bearing and holding surface provides for accuracy in reading the scale. The base is 2 in. diameter and the rods are but $\frac{1}{2}$ in. diameter, adapting the tool for use in small places. The measuring capacity of the tool is from 0 to 3 in. by thousandths of an in. This range is obtained by the use of the three interchangeable rods which are secured to the knurled cap. The screw has a movement of 1 inch. Each gage is equipped with a patent lock nut to maintain the reading, and can be had with or without the ratchet stop.



Lufkin Micrometer Depth Gage with half round base.

"MAKES TAPPING EASY!"



The NEW "PROCUNIER" HIGH SPEED TAPPER
WITH "DOUBLE-CONE" CORK CLUTCH AND AUTOMATIC REVERSE
For High Speed Sensitive Tapping On Drill Presses

Has Ball Thrust Bearings, Balanced Reverse, Bronze Bushings.
Capacity, $\frac{1}{2}$ " Cast Iron, $\frac{7}{16}$ " Steel. Price only..... \$45.00
Write For Free Trial

Procunier Safety Chuck Co., 12 So. Clinton St., Chicago, Ill.

A most REVOLUTIONARY LATHE DEVELOPMENT...

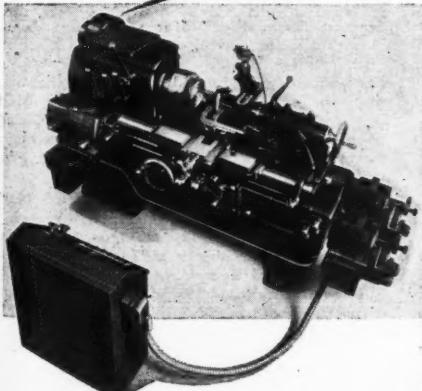
The latest contribution of the Monarch Machine Tool Company, Sidney, Ohio, toward broadening the field for the use of lathes . . . the Monarch-Keller Automatic Form Turning Lathe in sizes from 14-in. to 36-in. swing . . . combines a standard engine lathe and an automatic form turning lathe. It is a Monarch Lathe with Keller automatic electrical control, and Twin Disc Clutch, built-in to form a complete unit.

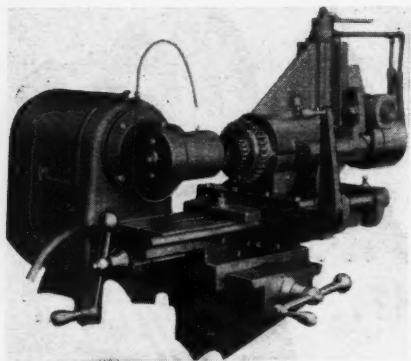
Especially adapted for

die and mould making and for turning many other intricate and odd shaped pieces . . . the use of this machine enables many jobs, ordinarily taking a day, to be completed in an hour or so.

The Twin Disc Clutch is a cut-off clutch and drives the entire main control. And it is particularly significant that *Twin Disc Clutches* are used exclusively on all sizes of *Monarch Lathes*.

Adaptable and compact, Twin Disc Clutches . . . in stock models and sizes as well as special models . . . meet modern methods of design and the highest machine tool standards of capacity, smoothness, all-around dependability and economy. Our Engineering Research Department will understand your clutch needs . . . write for recommendations. Engineering Data Book on request. *Twin Disc Clutch Company, Racine, Wis.*

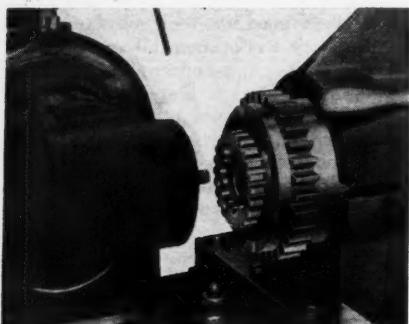




C M & T Gear Recessing Mechanism.

C M & T Recessing Mechanism

The City Machine & Tool Works, June at E. Third St., Dayton, Ohio, has developed as a part of the Peerless Tooth Chamfering Machine a mechanism for chamfering and intermittently recessing gear teeth, an operation increasingly required by the development of "quiet second" speed transmissions, four speed transmissions, and transmissions of the "free wheeling" type. In Fig. 1 of the accompanying illustration, a general view of the mechanism is shown with an internal gear mounted in position, just after completion of an operation in which every other tooth was recessed to a depth of $\frac{1}{8}$ inch. In such a case the gear teeth can be chamfered or rounded after the recessing operation, if desired. A cam, located in the rear, actuates the mechanism to obtain the in-and-out motion as desired. From



Gear after processing.

this it is evident that the machine can be arranged to recess or skip practically any number of teeth. Fig. 2 shows a close-up view of the part itself after completion of the cutting operation. Although the piece shown is an internal gear, the process is equally applicable to external gears.

Starrett "Semi-Flex" Hacksaw Blade

A hacksaw blade developed especially for such troublesome jobs as the cutting of pipe, angle iron, wire cable, electrical conduit, BX cable, and similar soft or thin metal sections has been placed on the market by The L. S. Starrett Co., Athol, Mass. The blade is called by the trade name of "Semi-Flex," due to the



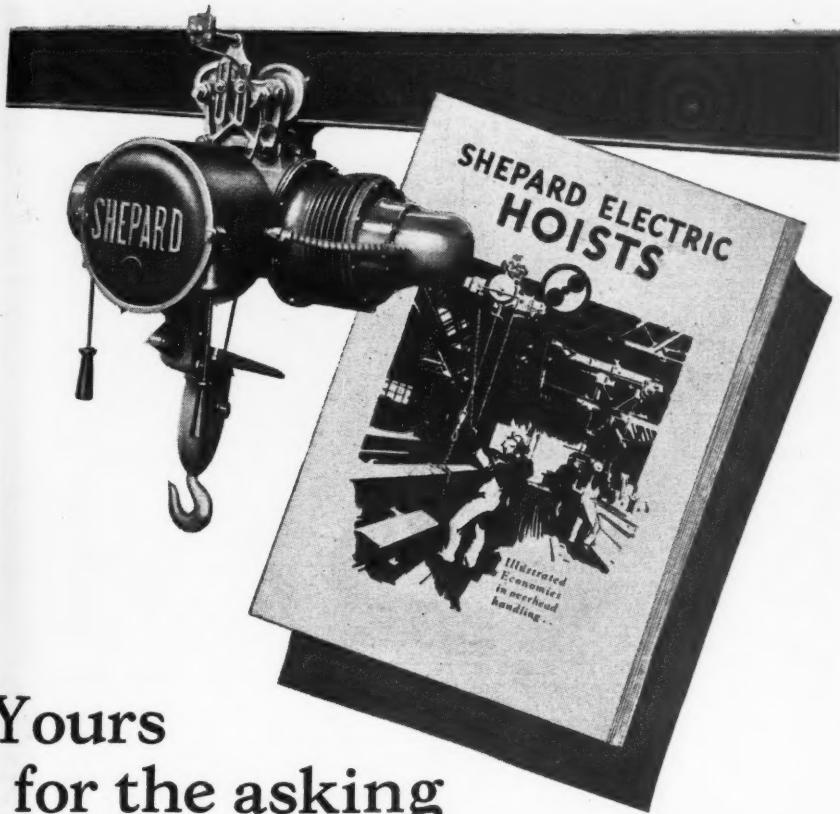
Starrett "Semi-Flex" Hacksaw Blade in use for sawing angle iron.

fact that it is flexible and can be used on jobs that strain or twist the blade without fear of breaking. The blade is made of tungsten steel and is carefully tempered to prevent shelling of teeth.

In the illustration a Semi-Flex blade is shown in use for cutting through a piece of angle iron of the type that ordinarily chatters and binds when cut with the ordinary blade. The Semi-Flex handles this type of work without difficulty.

"Bikeko" Die Head

The Bignall & Keeler Machine Works, Edwardsville, Ill., has added to its line a new die head that is to be known by



Yours for the asking

A volume of facts about planned load handling! Actual examples of striking economies in time, labor and cost that Shepard Electric Hoists have effected in practically every branch of industry.

If economical handling is of interest to you, let us show you a few dozen typical examples that have been effected through the proper use of Shepard Hoists in a variety of industries all over the country.

Ask for the new Shepard book of "Illustrated Economies"

SHEPARD NILES CRANE & HOIST CORP.

Main Office: 424 Schuyler Ave., Montour Falls, N. Y.
Works: Montour Falls, N. Y. and Philadelphia, Pa.

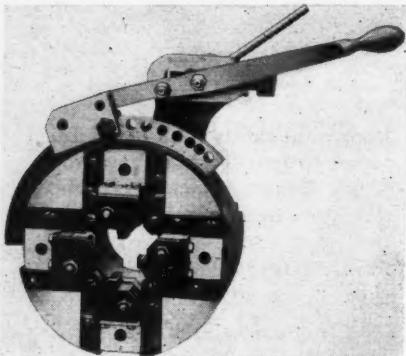
SHEPARD
CRANE & HOIST DIVISION



the trade name of "Bikeko." The mechanism of the head is simple and easy to operate, one upward movement of the die lever serving to lift all dies clear of the pipe and coupling. The positive lock on the screw adjustment is said to insure accurate duplicate threads after the adjustment has been set for a given size. The fine pitch adjusting screw provides a very delicate and positive adjustment for standard or special size.

High cutting speeds are made possible by the use of high speed steel dies with curved eccentric relief, reducing friction to a minimum. The cutting edge on the die is well ahead of the center line, which is said to give the best results. The die block is made in two sections. The upper section, which holds the die, is provided with screw adjustment for increasing or reducing the clearance on each side. The die slides have exceptionally long travel, allowing one set of dies to handle all sizes within the capacity of the head so long as the taper and thread remain the same. The high speed steel dies and adjustable clearance permit very high operating speeds without damage to the threading dies. An advantage lies in the fact that one die can be replaced without renewing the entire set.

In changing from one size to another, it is only necessary to remove one screw and re-insert in the proper hole for the

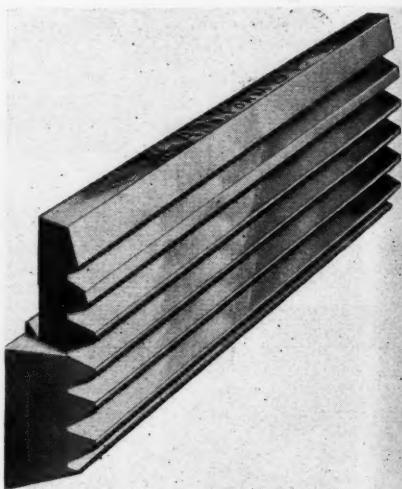


"Bikeko" Die Head.

next size. Additional adjustment is obtained with the fine pitch adjusting screw. "Bikeko" die heads can be furnished on new Peerless and PDQC machines, or for any power-driven threading machine now in service.

Landis Ground Thread Chaser

The Landis Machine Co., Waynesboro, Penna., has placed on the market a ground thread chaser for use in all sizes of the "Lanco" and "Landex" heads and



Landis Ground Thread Chaser.

for the $\frac{5}{8}$, $\frac{7}{8}$, $1\frac{1}{4}$ and 2 in. "Landmatic" heads. This chaser is said to make possible an unusually fine degree of accuracy. The thread form is ground on special grinding machines by a process which is said to remove the minor distortions and inaccuracies resulting from the heat treatment, as well as to produce a uniform thread with a flat crest and root. It is also said that the ground thread form offers exceptional accuracy and increases the life of the chaser between grindings.

"Clarktor" Crane

A variable-height crane, powered by a tractor-type gas engine and having a capacity to lift 2,000 lbs. to a height of 13 ft., has been placed on the market by the Clark Tructractor Co., Battle Creek, Michigan. When the crane-boom is horizontal, the entire equipment has an overall height of but 7 ft. 10 in., making it easy to negotiate plant and warehouse doors. The crane is built on a "Clarktor" tructractor chassis, which has a

SOMETHING ENTIRELY NEW IN DRAWING TABLES

HAMILTON AUTO-SHIFT DRAWING TABLE

INCREASES DRAFTING SPEED—

Any working position of top obtained in a few seconds.

PROMOTES THE DRAFTSMAN'S HEALTH—

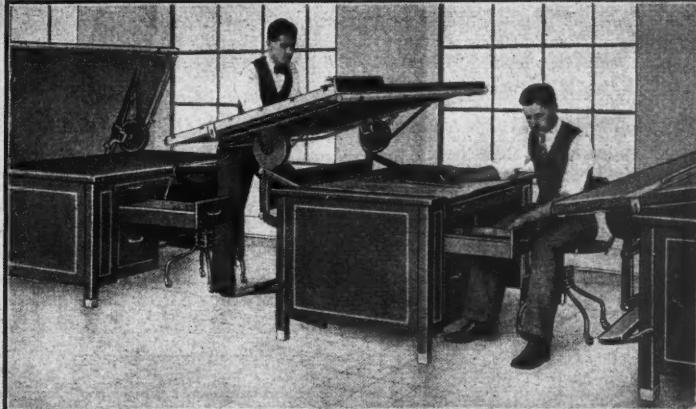
Eliminates cramped positions. Draftsman works at ease in swivel chair. Reduces fatigue.

ECONOMICAL—

Saves floor space. Gives draftsman a drawing surface and reference desk with large drawer, with 25% less floor space than occupied by two tables. More efficient and saves time.

CONVENIENT—

Enables designers to bring their work to close eye-range.
Use the coupon.



HAMILTONIZE and ECONOMIZE

Hamilton Mfg. Co.

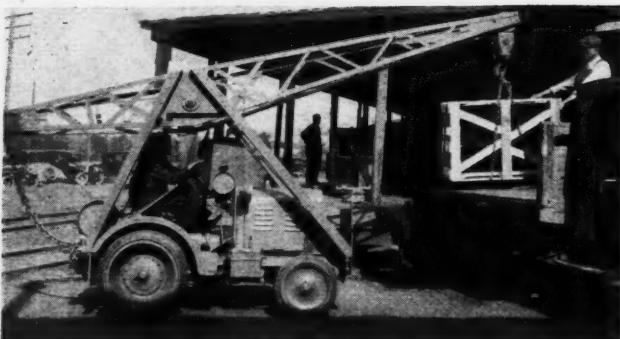
Two Rivers, Wis.

HAMILTON MFG. CO., Two Rivers, Wis.

Please send me Circular A7

Name _____	State _____
Firm Name _____	
Title _____	
Address _____	
City _____	

"M.S."



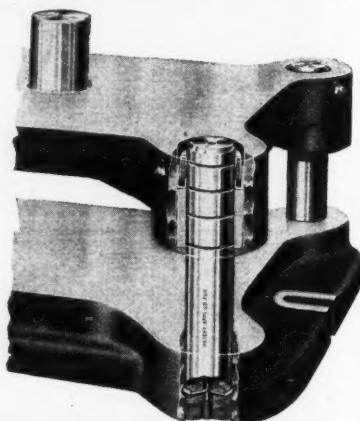
"Clarktor" Crane

turning radius of only 108 inches. The tractor type engine uses from five to six gallons of gas and a pint of oil daily in ordinary use, and is capable of 24-hour operation. Standard truck transmission, Clark truck axle, and multiple disc clutch provide for dependable service. Equipment includes self-starter, generator, battery, and head and tail lights. The crane is particularly useful in handling heavy parts to the machines or in storage. Heavy crates, boxes, or other loads can be easily tiered, thus enabling the plant to make use of its "air rights" and conserve floor space.

Baumbach Quick Demountable Leader Pin

The E. A. Baumbach Manufacturing Co., 1806 S. Kilbourne Ave., Chicago, Ill., has developed a leader pin with a locking device for use with leader pin die sets. The development is known

as the Baumbach Quick Demountable Leader Pin, and is designed to lock leader pins positively in the die shoe. A feature of the pin is the speed with which it can be mounted and dismounted. It consists of a leader pin fitted with three studs, a pressure spring to retain the studs, and a hollow head cone-point locking screw as shown in the illustration. By turning the locking screw with a socket wrench, the pres-



Sectional View of Baumbach Die Set Equipped with Baumbach Quick Demountable Leader Pins and Automatic Oilers.

GROBET SWISS FILES



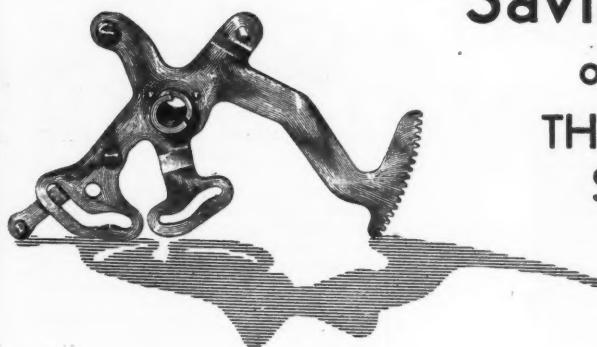
FOR ILLINOIS FILING MACHINES

GROBET SWISS FILES are precision files of high cutting speed, unexcelled for durability. They are required by every manufacturing line where accuracy in filing is essential.

Grobet Swiss Files are made in nine numbers of cuts: Nos. 00, 0, 1, 2, 3, 4, 5, 6, 8. Ask for catalog K showing 3,500 different styles. Specialties: Files for filing machines—Illinois, Hartford, Oliver, Cochrane, La Porte, Thiel, Excel, etc.

GROBET FILE CORP. of America

3 Park Place, New York City



Savings on THOSE SPECIAL JOBS

MANY manufacturers, not knowing of the peculiar advantages of the High Speed Gear Shaper, are producing gears by other methods over which the Fellows Gear Shaper can show a considerable saving.

As an illustration, many parts containing gear teeth are being blanked and shaved on punch presses, which, owing to high upkeep expense on dies, etc., could be produced better and at lower cost on the High Speed Gear Shaper.

This is no idle boast; we have helped other manufacturers cut their costs and would welcome the opportunity to help you cut yours.

Ask for copy of booklet No. 10—no obligation.

THE FELLOWS GEAR SHAPER CO.

Head Office and Works: 78 River St., Springfield, Vermont

Branch Office: 1149 Book Bldg., Detroit, Mich.

How Much Does it Cost?



No. 3

Also available in three other styles.

PRODUCTION costs are getting serious consideration today! Obsolete methods—obsolete machinery are "getting the gate." Cost sheets are being scanned constantly—thoroughly. Plant executives today are turning to HOPKINS Air-Operated Cylinders (Non-Rotating, Tubular Type) for the solution of production problems. Profitable time, energy and lost motion are being SAVED by the use of Nature's cheapest productive factor—AIR. Let us help you, too. Write for engineering data.

THE TOMKINS-JOHNSON CO.
JACKSON, MICH.

Representatives in Principal Cities



sure spring is expanded into a recess in the die shoe, and by reversing the operation, the pin is again loosened, provid-

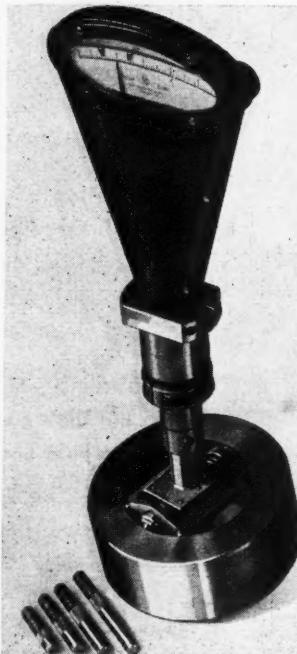


Cut-Away View of Baumbach Quick Demountable Leader Pin.

ing easy removal. The pins can be removed from the die shoes any number of times with perfect assurance that they can again be positively locked and in perfect alignment.

Krupp Mikrotast Indicators

The illustration shows the Krupp Mikrotast Indicator, which is being mar-



Krupp Mikrotast Indicator

keted by the Coats Machine Tool Co., Inc., 112 West 40th St., New York, N. Y.

Improve Your Product *with* PRESSED METAL!



TODAY, as never before, Industry is turning to pressed metal to improve its many products. Everywhere . . . from vacuum sweepers to heavy machine tools . . . pressed metal parts are making good!

And they'll make good in your product also. One or two parts made of pressed metal may save you thousands of dollars by eliminating expensive machining operations, reducing weight, saving labor and breakage.

Others have improved their products with pressed metal, perhaps you can, too. Metal Specialty engineers will tell you. Just send your parts list or catalog. There's no charge for this service.

The Metal Specialty Co.

1530 SIXTH ST., WEST

CINCINNATI, OHIO

The Mikrotast Indicator depends for its amplification upon a knife-edge multiplication system, consisting of an arrangement of three knife edges permitting an internal lever arm length of .008 inch. This relatively long leverage not only tends to reduce contact pressure, but also ensures marginal scale accuracy—even though this scale is $2\frac{1}{2}$ in. long. With the Mikrotast, amplification ratios as high as 1000:1 may be obtained, making it possible to gage by fractions of "tenths."

The Mikrotast may be used in a pillar stand, leaving the operator's hands free to handle the work, or in various tools such as saddle gages, or with a special attachment which converts it into an internal micrometer gage. Krupp Mikrotast Saddle Gages are made with three-point contact for determining a true circle, 13 saddles being available covering the range from $\frac{1}{4}$ in. to $39\frac{3}{8}$ in. Set to a plug gage, the saddle gage shows in figures any deviation from the size desired within .0001 inch.

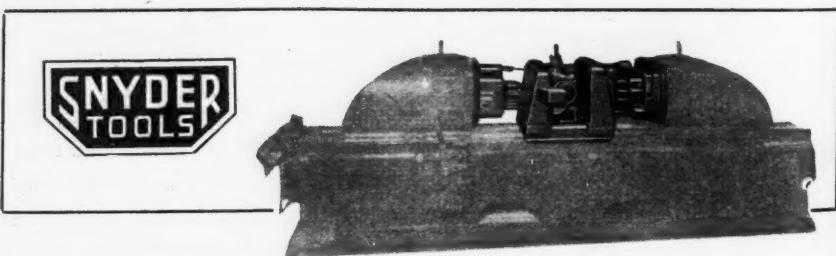
A singularly even and accurate transmission is claimed for the Mikrotast, similar to a long center crank-drive with the lower end of the upper transmitting rod resting on a plane. A collar or flange provided on the lower transmit-

ting rod protects the instrument against a heavy overload. The contact spindle is made either of a special hard steel or is faced with "Widia"—a tungsten carbide alloy of diamond hardness.

"Cincinnati" Roll Grinder

Designed for grinding barrels and journals of both parallel and cambered rolls, the new roll grinders announced by Cincinnati Grinders, Inc., Cincinnati, Ohio, embody a number of unique and interesting features. One of these machines, with a capacity of 34 x 192 in., is shown in the illustration. The tool is of the traversing table type. All movements are motor-actuated, five motors being employed as follows: one variable speed motor of 10 h. p. for work rotation; one constant-speed motor of 30 h. p. to drive the grinding wheel spindle; a 5 h. p. constant-speed motor to drive the feed box operating the table reversing mechanism; a 1 h. p. motor to operate the rapid traverse mechanism for the grinding wheelhead, and a $\frac{1}{2}$ h. p. motor, vertically mounted, to drive the vertical centrifugal coolant pump.

The outstanding features of the machine are the centralized control which



SNYDER FLEXIBILITY Keeps your equipment up-to-date!

This illustration shows a well-known drilling machine equipped with SNYDER Multiple Heads and Fixtures for drilling holes in the top and bottom of a crankcase.

The outstanding feature of this installation is the ease with which the heads and fixtures may

be removed and new ones installed without disturbing the machine. The advantages of such flexibility are instantly apparent to manufacturers.

SNYDER flexibility will keep your equipment up-to-date. Let us show you—write for details.

Snyder Tool & Engineering Co.
3400 E. LAFAYETTE AVENUE

DETROIT, MICHIGAN

Cut Tap and Drill COSTS IN HALF

Here is a sure way to cut tap and drill costs—grind them perfectly on these two machines and they will last twice as long.

THE GRAND RAPIDS TAP GRINDER

GRINDER does a perfect job because it grinds all flutes of practically any right or left hand tap *exactly alike*, and in less time than by any other method.

THE GRAND RAPIDS DRILL GRINDER does a perfect job because the drill is always placed *automatically* at the correct grinding angle. Also, there is only one simple

adjustment necessary when changing from one size drill to another.

And, the com-

bination machine will grind both taps and drills.

Write For a Bulletin



Grand
Rapids
Tap
Grinder

GALLMEYER & LIVINGSTON CO.

348 Straight Ave.; S. W.
GRAND RAPIDS, MICH.



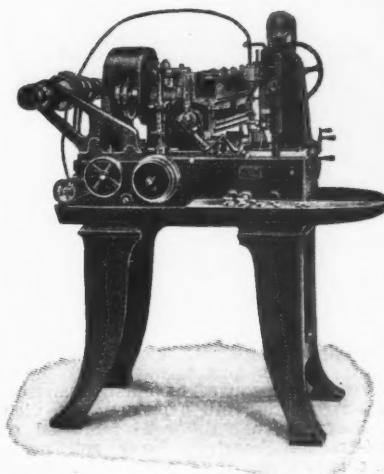
Grand
Rapids
Drill
Grinder

PRECISION RACKS

Up to 40" Length, 10 D. P.

are most economically produced on our

KOEPFER AUTOMATIC RACK CUTTER



Automatic operation.
Vertical cutting action,
using single or
gang cutters.

Ask for Catalog E

GEORGE SCHERR CO.

142 Liberty Street

New York



Fig. 1—Front View of Cincinnati 34 x 192-in. Roll Grinder.

enables the operator to exercise complete control over all functions from one small platform, and the simple and flexible cambering mechanism which enables

with a swiveling top table which can be quickly set over for grinding this taper. Special mounting blocks fitted to the table provide for grinding rolls without removing the anti-friction bearings that have been fitted to them, and thus the axis of rotation of the roll while in actual service is duplicated while grinding.

All the usual conveniences of operation are provided on this tool, including hand-operated rheostat control to the work - rotation speed, push button switches for motors, selective speed changes with one lever for all table traverse speeds, and micrometer in-feed control with an auxiliary rapid traverse mechanism for rapidly positioning the wheel when changing from one major diameter to another. The footstock carries the radius-truing device for rounding the corners of the grinding wheel to grind fillets in the roll ends, also the wheel face crowning equipment which is used when grinding wheels of concave contour.

The table traversing mechanism is of the regular Cincinnati design, power being supplied from a 5 h. p. motor which drives through a jackshaft to the gear box. This motor also supplies power to a small oil pump which is used to circulate the oil under pressure to the table ways. The grinding wheel head spindle is mounted on preloaded S.K.F. bearings, and is driven from the jack-

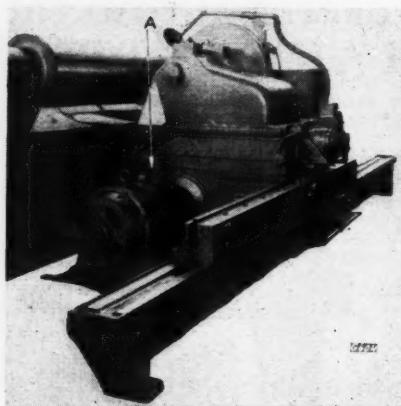


Fig. 2—Arrangement of Drive to Wheelhead.

rolls to be contoured to suit the particular duty of the roll in process. In view of the fact that the rolls mounted on anti-friction bearings have roll necks which are taper, the machine is equipped

GOOD GRINDING RESULTS . . .

can only be obtained when grinding wheels are properly dressed and have keen cutting edges.

The Desmond-Huntington Dresser is an excellent tool for keeping every grinding wheel sharp and true, especially wheels where quick action is necessary.

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THE DESMOND-STEPHAN MFG. CO., Urbana, Ohio



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*for better
RESULTS!*



When you use a Connecticut combination round and spline broach, you are assured of great savings in time, reductions in tool costs, and a more accurate job. These results are positive because this tool broaches the drilled hole to size, cuts the splines and removes the burrs *in one operation*.

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TOOLS

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Production Tools.

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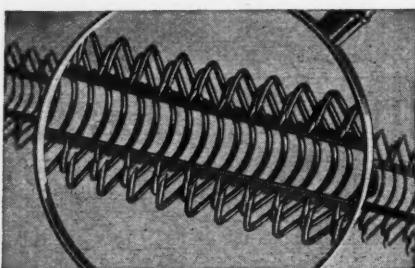
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All belt lacing is not alike. Neither are the results.

Safety Belt Hooks with new, exclusive features provide new belt lacing advantages and produce large savings in thousands of industrial plants.

STOP BELT HOOK ACCIDENTS . . . loose hooks that injure skilled hands and menace production costs are prevented by the patented Steel Binder Bars. Each hook is held firmly in place.

FIVE PROFITABLE ADVANTAGES . . . with no frayed hooks to damage belts, longer and more satisfactory belt service is produced. Waste power transmission is reduced because the Steel Binder Bars assure uniform pull and retain the trueness of belt ends. Double staggered hooks firmly grip the belt with the minimum belt weakness. No waste, hooks are held in perfect alignment by the Steel Binder Bars. Only two operations, cut and lace.

That is why thousands of Factory Superintendents and Maintenance men have turned to this improved lacing to end their belt lacing problems and start new savings in their plant operations. Only Safety Belt Hooks can give you these advantages. Ask for a sample strip.

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SAFETY BELT-LACER CO.
TOLEDO, OHIO, U. S. A.

shaft by a Morse silent chain of special design.

As the camber requirements of most rolls are determined by a number of variables which make each installation the subject of special study, a camber mechanism has been developed which consists essentially of an auxiliary bracket carried on a three-point support, the center support being bolted securely to the rear base of the grinding machine and the two outer feet resting on wedge blocks on the shop floor. A carriage is mounted on this accurately - machined base, the carriage being in excess of the maximum length of roll surface to be ground. The movements of the carriage and roll grinder table are synchronized and cambering of the roll surface is obtained by tilting the grinding wheelhead at the pivotal point marked A in Fig. 2. The swing of the grinding wheelhead and its supporting base can be accurately controlled. With a camber bar equal in length to the roll surface to be ground, operated through a massive lever mechanism with a ratio decrease of $1\frac{1}{2}$ to 1, any shape required can be produced. The drive from the grinding machine table traversing mechanism to the carriage of the camber mechanism is powerful and accurate, and smoothness of motion is obtained by the force feeding lubricating system used on the cambering mechanism.

"Four-Grip" Rigid Tool Bit Holder

The illustration shows the "Four-Grip" Rigid Tool Bit Holder which is now be-



"Four-Grip"
Rigid
Tool Bit Holder

ing marketed by the Four-Grip Tool Co., 109 East Seventeenth Street, Paterson, N. J. The feature of the Four-Grip holder is the manner of clamping the tool bit in place. A set-screw bears down

THE "OK" SYSTEM

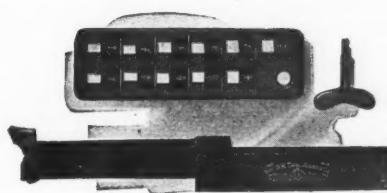
You can obtain tool bits for all classes of operations and different machines by adopting the "OK" System.

The tool bits are forged of high speed steel and come to you ground and heat-treated ready for immediate use.

Only one holder is required, as all shapes of one size are interchangeable.

Think of the advantages!

Begin today to profit by using the complete system. Send for catalogue.



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MANUFACTURERS OF TOOL BITS FOR USE ON LATHE, PLANER, BORING MILL, SHAPER, ETC. ALSO INSERTED TOOTH MILLING CUTTERS FOR ALL PURPOSES.

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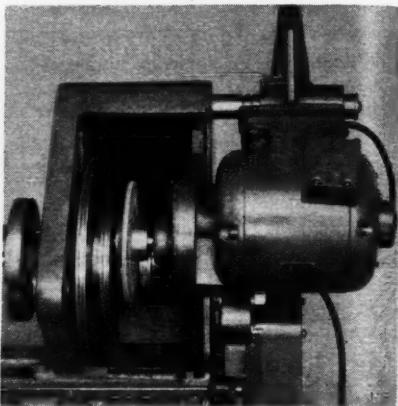
on a V-block which bears the whole length of the tool bit, locking it firmly in position and preventing any slippage or distortion. The holder is a steel forging, and the setscrew and V-block are of hardened steel.

Schaffner 11-In. Lathe

The General Radial Drill Co., 1767 Elmore Street, Cincinnati, Ohio, is now marketing an engine lathe of 11-in. size, known as the Schaffner Lathe. This machine is the result of an effort to produce a machine that is both simple in design and accurate in operation, and is built to handle any job that can be machined in a lathe of this size.

The lathe is self-contained with motor drive, power being transmitted from the motor to the spindle through a Gibbs V-Disc Transmission. Seven spindle speeds, from 68 to 600 r.p.m., are immediately obtainable by the simple process of shifting the motor right or left as indicated by a finger on the headstock. The shift of the motor is positive and foolproof, and the transmission is compact, efficient in power transmission, and will not slip. Current to the motor is controlled by a switch within easy reach of the operator, and the motor is automa-

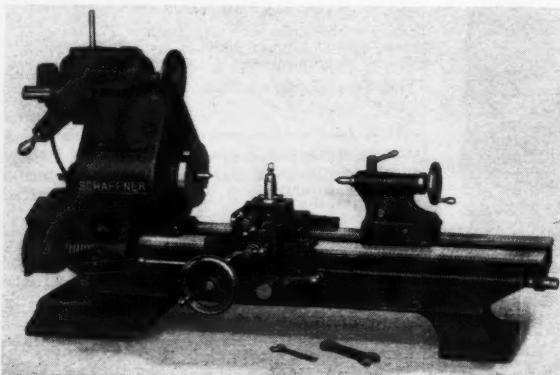
contact ball bearings which are adjustable for wear. The spindle is made of a special grade of alloy steel, with a $\frac{7}{8}$ -in. hole extending through it for long work. The compound is graduated and may be



Rear view of Headstock, showing Gibbs V-Disc transmission

set at any angle, and the tailstock may be set over for taper turning or boring. Longitudinal power feeds are controlled by a quick-acting lever on the carriage.

Forty feeds, from 0.004 to 0.125 in., or 40 threads from 8 to 224 per inch are available through the quick-change gear box. The cross slide has a travel of $6\frac{1}{2}$ in., and the top slide, 2 in. The maximum distance between centers on the lathe with the 4-ft. bed is 24 in.; with 5-ft. bed, 36 in. The machine can be furnished for use on a bench as shown in the illustration, or mounted on floor legs. A steel oil and chip pan can also be furnished if desired. Standard equipment includes motor, switch, five feet of rubber cable, small face plate, two centers, center sleeve for headstock, tool post, and thread indicator. Weight, crated, 4-ft. bed, 475 lb., with 5-ft. bed, 525 pounds.



Schaffner 11-in. Lathe

tically protected against overload and low voltage phase failure.

The back shaft is mounted on ball bearings, and the spindle runs in angular

January, 1931

Modern Machine Shop 105

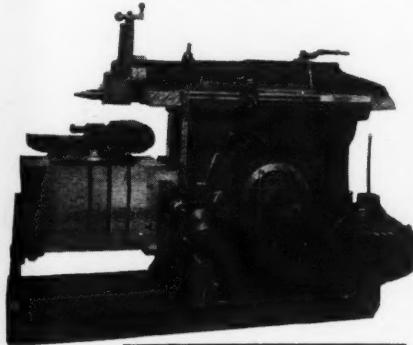


Simplifies Your Shaping Problems!

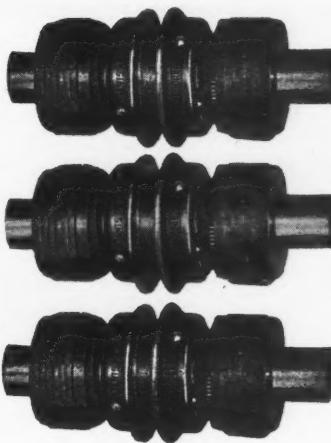
THE hardest problems to solve with most shapers are increasing the output and maintaining or improving the accuracy of the work.

But there are many features of the COLUMBIA "SUPERIOR" SHAPER which simplify these problems. For example—centralized control, cross rail locked by one lever, longer stroke on angular cuts, patented quick-change feed, extra large table with improved outer support, selective speed box with hardened, alloy steel gears, flood lubrication.

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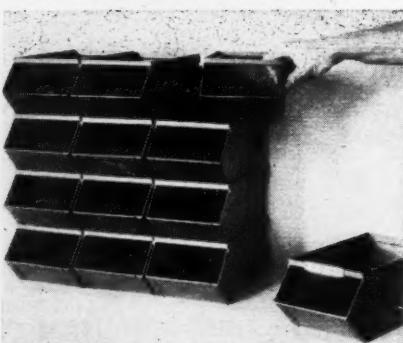
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MMS-1



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are already saving their cost many times over in hundreds of shops by reducing handling costs.

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Built in four standard sizes, but can be furnished in sizes to meet your particular requirements.

Bin No.	Width	Height	Length
1	5 $\frac{1}{2}$ in.	4 in.	12 in.
2	7 $\frac{1}{2}$ in.	5 $\frac{1}{4}$ in.	15 in.
3	9 in.	6 $\frac{1}{4}$ in.	18 $\frac{1}{4}$ in.
4	12 in.	9 $\frac{1}{4}$ in.	20 in.

SIMPLEX TOOL CO.
WOONSOCKET RHODE ISLAND

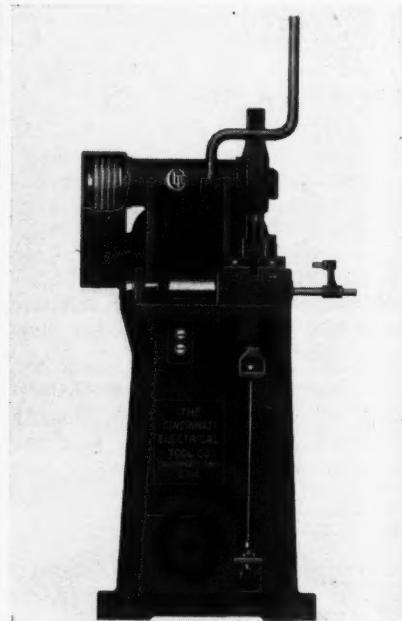
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Kindly send illustrated circular describing and giving prices on the Simplex Nesting Bin.

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"Cincinnati" High-Speed Cut-Off Machine

The Cincinnati Electrical Tool Company Division of the R. K. LeBlond Machine Tool Company, Cincinnati, Ohio, has announced a High Speed Cut-off Machine suitable for cutting steel alloys and non-ferrous metals such as brass, copper, aluminum, as well as fibrous materials of all kinds, an-



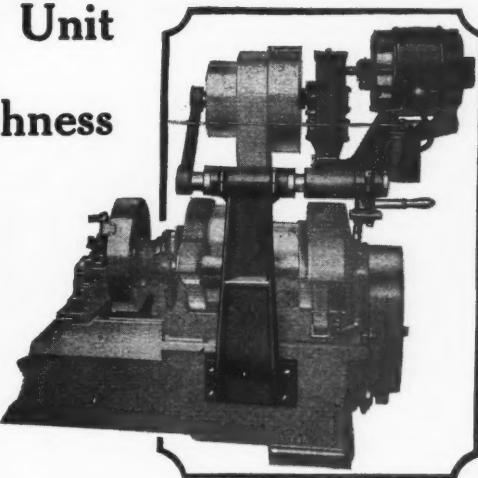
"Cincinnati" High-Speed Cut-Off Machine

gles and shapes up to 2 $\frac{1}{4}$ -in. inclusive. The "Cincinnati" Cut-off Machine uses an abrasive wheel either 12 or 14 in. in diameter by 3/32-in. thick by 1 in. bore, and operates at a peripheral speed of approximately 15,000 to 16,000 surface feet per minute. The wheel is completely guarded with the exception of that portion necessary for the cutting operation, insuring perfect protection to the operator at all times. The sparks and the abrasive dust are carried backward from the operator through an exhaust connection to a water pan within the pedestal.

The machine is driven by a 7 $\frac{1}{2}$ h. p. fully enclosed ball-bearing motor, operat-

A Motor Drive Unit with Belt Drive Smoothness

Motorize and modernize your cone pulley lathes with Cullman Lathe Drives. Quickly and easily attached to lathes. Only four bolt holes needed. Made in sizes for lathes from 14" to 36", in 1, 2, 3 and 5 h. p. sizes.



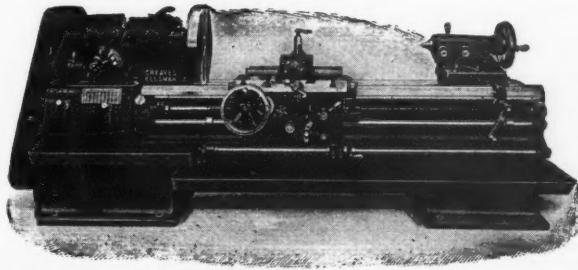
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You'll be surprised at the ease with which you can simplify your lathe operations, increase production and save time.

G.K. Single Lever Control enables your operator to INSTANTLY select any speed of an extremely wide range through one lever.

It eliminates the necessity of searching through several combinations of levers for the right speed.

Send for a G.K. Catalog—it describes many more features of vital interest to the production men!

THE GREAVES-KLUSMAN TOOL CO., Cincinnati, Ohio

ing at a speed of 3600 r.p.m. with Vee belts from the motor to the spindle which carries the cutting wheel, and which is also ball-bearing equipped. The cutting wheel, spindle, wheel and wheel guard are mounted on a swivel arm which pivots on the pedestal and is balanced by the weight of the motor in the rear, which is also mounted on the same arm.

The machine is suitable for making cuts straight or angle up to 45 deg., the same vise being suitable for the various cuts. The vise is mounted and clamped to the base of the machine, the graduations on the table making angle-cutting accurate and fast. The material to be cut is held in the vise by pressure on the foot lever, for both straight and angle cuts, and the abrasive wheel is moved into the work by means of a hand lever at the front of the machine. No water or other coolant is required when cutting various materials, there being no danger of drawing the temper of the material out. A stop is provided which can be set for any depth of cut within the capacity of the machine, and the length of the material to be cut is regulated by a longitudinal stop, which is adjustable to various lengths. The machine is 60 in. high overall, and the floor space required is 43½-in. by 26-in. Weight: 1,250 pounds.

The standard machines may be had for 220, 440 or 550 volts, 60 cycle, 2 or 3 phase, as well as direct current, 115 or 230 volts. All motors are equipped with automatic starters with both overload and undervoltage protection and push button control.

Verson All-Steel, Overhanging Type, Permanently-Inclined Press

The LaSalle Machine Works, Inc., 3015 S. LaSalle Street, Chicago, Ill., is now manufacturing the Verson line of all-steel, overhanging type, permanently-inclined presses, one of which is shown in the illustration. These presses are constructed of rolled steel plates, cut to size and shape by the acetylene cutting process and welded into units. The ribs and supports are so placed as to afford a maximum of rigidity. When tested with a 50 per cent overload, the frame showed no appreciable amount of deflection and no "labor" was apparent in any of the moving parts.

The press illustrated is of 250 tons capacity and has an 8½-in. crankshaft, 10 in. stroke, and 14 in. depth of throat. The frame, ram, and gears are all of

ANNOUNCING A NEW — HEAVY DUTY HOLLOW MILL ADJUSTABLE BLADE TYPE

Introducing new principles of design to greatly increase the efficiency of turning, facing and shoulder cutting, made rugged to operate under heavy feed and will give high quality finish and uniform accuracy.

For MACHINING FORGINGS, CASTINGS, BAR STOCK, etc.

Quickly adjustable for different sizes of work without regrinding. Adjustments are made by simply rotating the cone shaped external nut. A micrometer dial on the



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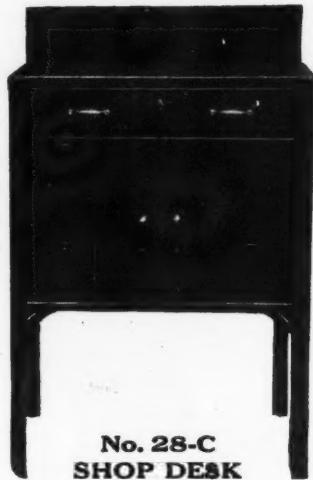
OUTSTANDING FEATURES: Longer blade life, $\frac{3}{8}$ inch fully adjustable, micrometer adjustment, shoulder cutting and facing, taper turning and multiple operation cutting, blades having four point support.

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**No. 28-C
SHOP DESK**

This Desk with the enclosed cabinet compartment meets the Foreman's every shop need. Desk stands 44" high at the front x 53" high at the rear, 34" wide x 28" deep. Drawer is 29½" wide x 27" deep x 3½" high, equipped with inside lock.

Lower Cabinet of size 18" high x 33¾" wide x 27¾" deep, with double doors, two handles and lock.

Desk finished in attractive olive green lacquer throughout; shipped fully set up and crated.

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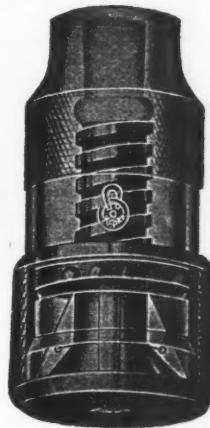
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and the door closes or opens. That is all the action you need with a

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SAVE LABOR WITH MIDWEST TOOLS



THE most expensive item in production is labor—save labor and you cut costs! The MIDWEST tools save labor by combining operations.

The tool illustrated combines four operations in one....it drills, reams, spot faces and chamfers.

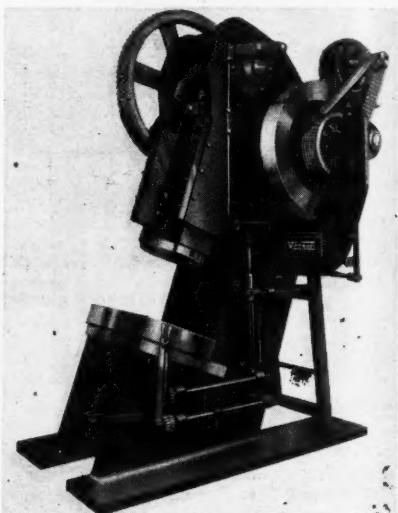
The Midwest Pin Drive is also an outstanding feature of the Midwest tools. This drive is a solid and accurate drive which eliminates all chance of breakage, gives extra long service and enables you to work to closer limits.

Here is a method which will cut your costs....get the details....write for a catalog!

Midwest Tool & Mfg. Co.
2362 West Jefferson Ave.
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welded steel plate construction and will withstand strain and stress to a degree heretofore almost unknown. The main bearings are bronze-bushed and the gibbs are of steel with bronze linings. The backshaft works entirely in Timken roller bearings, and similar bearings are provided for the crankshaft and flywheel support. Annular ball bearings are supplied in the pinion support.

The multiple disc friction clutch, which is also roller bearings, is equipped



Verson All-Steel, Overhanging Type, Permanently-Inclined Press.

with an automatic safety stop designed to disengage at the top of the stroke. The clutch can, however, be disengaged at any point of the stroke by means of an auxiliary hand lever device. Herringbone back gears and pinions aid in providing for quiet operation as well as providing an unusually good drive.

The gibbs and gibways are unusually long, and the top of the ram is never out of the gibways. Motor Texrope Drive employing the V-belt principle, is applied, and lubrication of the working parts is effected through a one-shot, fluid grease system. The wide base in no way interferes with the clearance required for ordinary safety of operation and the rear supports have been converted into a ladder to make easily accessible those parts of the press which are beyond reach from the floor.

GREATER CAPACITY On Less Power!

That's another superior feature of GUSHER COOLANT PUMPS for modern machine tools. Add to that a lifetime of reliable and efficient service and you can understand why GUSHER Pumps are preferred for economy.



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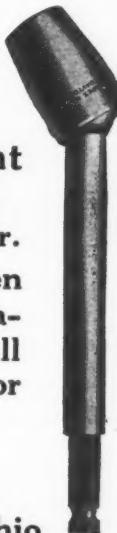
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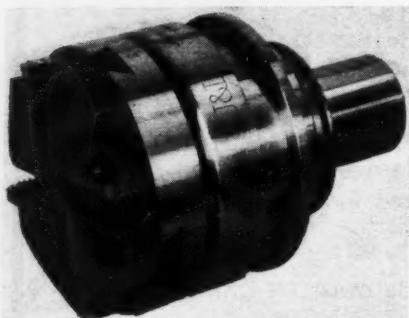


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THE APEX MACHINE CO. :: Dayton, Ohio

J. & L. Model 21 Tangent Die

The Jones and Lamson Machine Co., Springfield, Vt., is now marketing a die in which the chasers are held tangent to the work rather than radial, as is the more common practice. This design is intended to provide an advantage in that



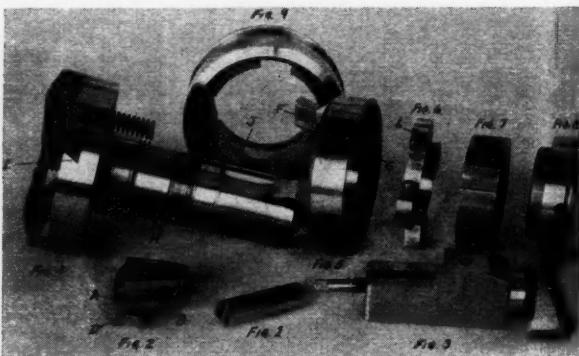
J. & L. Model 21 Tangent Die

the dull and worn portion on the ends of the chasers may be completely removed at a sacrifice of only a small fraction of the length of the chasers. Furthermore, as the grinding is done on the ends of the chasers and not on the chamfer, machine adjustments for the length of thread do not have to be made when chasers are changed. A worn-out set works just as close to the shoulder as a new set. The chasers are said to be accurate in shape, spacing, and helix angle and to make them effective the die and holders must be of equivalent accuracy.

The chasers shown in Fig. 1 have the thread profile ground at the correct helix angle for a given diameter and pitch, and are at the same time spaced relative to one another so that they track perfectly. The dovetail on the back of the chaser is also ground and ratchet teeth are cut on the tongue of the dovetail which engages a group of mating teeth in the chaser holder. The chaser holder, Fig. 2, has a ground dove-

tail (A) which receives the chaser, supporting it directly behind the cutting edge. The plug (B), Fig. 2, in the chaser holder fits a hole that is accurately located and ground. The teeth on the end of the plug engage the teeth on the back of the chaser and secure it against lateral movement. The plug is secured in position by the screw (C), Fig. 2, which also operates the plug when the chaser is to be removed. The chasers are sharpened by removing from the end an amount equal to the pitch of the teeth on the back. They are then measured in the gage, Fig. 3, and a graduated microscope tells exactly where the cutting edge will be when the chasers are in the die.

The dovetail (D) on the chaser holder, Fig. 2, is ground to fit the ground dovetail (E) in the body, Fig. 4, and when assembled it will be seen that the chaser just clears the front face of the body and that the overhang, so hard to eliminate in a die using this type of chaser, has been reduced to a minimum. The radial movement of the chaser holder is controlled by the cam ring, Fig. 5, the lugs (F) being ground concentric and true with the face (G). In operation, the backward movement of the operating sleeve causes the locking ring to rotate



Details of J. & L. Tangent Die

slightly and release the cam ring which, being forced back by the springs, opens the die. The forward movement of the operating sleeve closes the die. The die is positive in operation and, due to the balanced design of the operating mechanism, opens easily under cut.



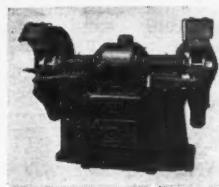
WRITE FOR CATALOG No. 20 - YOU'LL FIND IT INTERESTING



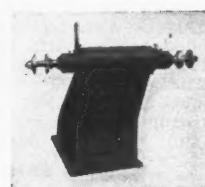
Combination Disc and Production Grinders, also Double Disc Grinders 2 to 10 H. P.



Tool and Production Grinders Bench and Floor Style. Sizes $\frac{3}{8}$ to $7\frac{1}{2}$ H. P.



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RAHN-LARMON EXTENSION BED GAP LATHE

Swing 16 $\frac{1}{32}$ ", 18 $\frac{1}{36}$ ", 20 $\frac{1}{40}$ "



Designed for general work in all types of shops. Has ample power to turn full diameters in the gap. By sliding the top bed gap can be varied to suit the requirements of the work. With gap closed is regular engine lathe. Belt driven or all geared motor drive.

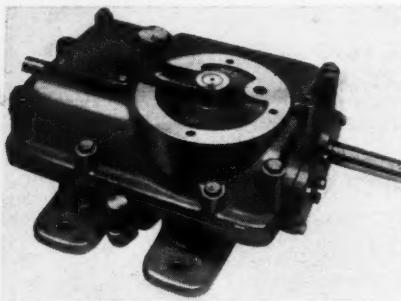
WRITE FOR CIRCULAR AND FULL INFORMATION

THE RAHN-LARMON COMPANY, 2935 Spring Grove Ave., Cincinnati, Ohio.

Adams MultiSpeed Reducer

The illustration shows a variable speed reduction box which has been developed by The Adams Company, Dubuque, Iowa. This unit differs from the usual type of speed reducer in that it combines in one housing a speed reduction and a sliding gear box mechanism, making the unit adaptable to any piece of equipment which it is desired to drive from a constant speed motor and yet on which a variation in shaft speeds is necessary.

This variable speed reduction incorporates four speed changes which are obtained through a single shift lever. The gears are of carburized and hardened steel with teeth on sliding gears rounded to facilitate engagement. The shafts are of alloy steel and are mounted on Timken tapered roller bearings. An oil level is maintained to keep the entire unit properly lubricated. On the standard unit input and output shafts are in



Adams MultiSpeed Reducer

line, but when necessary, units can be furnished for right angle drive. A wide variety of speeds and horsepowers are obtainable for each of the sizes of standard housings.

"Hi-Up" Electric Hoist Adapted To Limited Head Room

A new wire-rope electric hoist that can be utilized under extremely low head room conditions is announced by the Chisholm-Moore Hoist Corporation, Tonawanda, N. Y. An idea of the compactness of this "Hi-Up" hoist can be gained by the fact that the $\frac{1}{4}$ -ton capacity measures only 13 in. deep, from bottom of runway beam to bearing point of lower hoisting hook.

The design of this hoist is very simple;

all parts are readily accessible. Minor repairs can easily be made by the average mechanic. The "Hi-Up" hoist is supplied either with lug suspension for



"Hi-Up" Electric Hoist

stationary mounting, or with ball-bearing push-type trolley. Push button control is standard. Rotating parts ride on Hyatt roller bearings, in a continuous grease bath. The ball-bearing electric motor, fully enclosed, is equipped with magnetic brake that operates the instant current is cut off. This provides accurate control and prevents drifting of the load.

"Cyclone" Twin-Hook Electric Chain Hoist

To efficiently handle bulky loads such as bar steel, automobile bodies, and so on, the Chisholm-Moore Hoist Corporation, Tonawanda, N. Y., offers the "Cy-

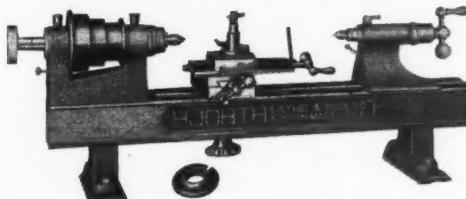


"Cyclone" Twin-Hook Electric Chain Hoist

clone" Twin-Hook Electric Chain Hoist. Capacities range from $\frac{1}{2}$ to 3-ton, inclusively.

The distance between load chains varies from 3 ft. to 15 ft., depending

Hjorth Precision Bench Lathe



Lathe No. 4, as illustrated, \$185.00.
Countershaft \$26.00. Collets (each) \$3.00.

THE HJORTH Precision Bench Lathe is the product of thirty years' lathe-building experience. It is highly efficient for shops where accuracy, speed and durability are essential. In the tool room and in the factory, for production and experimental purposes, it will handle light, medium

and heavy loads with equal ease. It is never idle. There are three sizes to meet various requirements.

No. 4—Collet capacity thru $5\frac{1}{2}$ ".
No. 5—Collet capacity thru $7\frac{1}{2}$ ".
No. 6—Collet capacity thru $11\frac{1}{2}$ ".
36" bed, 18" between centers. $8\frac{3}{8}$ " swing over ways.

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24 SCHOOL STREET

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USE A POWELL BLOW-GUN
AIR VALVE TO
*blow your turnings
or borings away*



*An
interchangeable nozzle
tip for every purpose*

**BLOW-
GUN**

POWELL VALVES

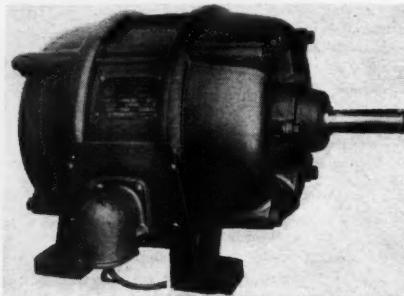
The WILLIAM POWELL Co., Cincinnati, Ohio

upon the particular handling job. When desired, containers are attached to the hoist frame for holding the slack chain and keeping it from touching the object lifted. Safety devices stop the operation of the hoist when the hooks reach either the highest or the lowest position. A magnetic brake acts instantly with shut off of current, and prevents drifting of the load.

Each hoist mechanism is equipped with eight ball bearings and four self-retaining roller bearings, and operates in a grease bath in a dust-proof, oil-tight frame. Controller is drum type, single speed, operated by pendant rope. Push button control is also available. The ball-bearing motor is fully enclosed. Electric-welded "Inswell" load chain is used.

Ideal Unit-Type Motor

The Ideal Electric & Manufacturing Company, Mansfield, Ohio, has completed the standardization of design of its electric motors so that the unit type of construction can be employed, thus conforming to the most advanced practice in engineering. The Ideal unit-type motors are said to present a number of new design features of considerable interest. The motor feet are placed on the bearing brackets so that all load



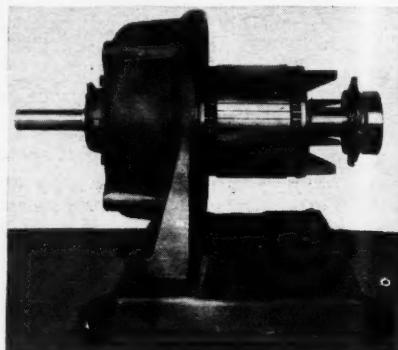
Ideal Unit-Type Motor.

shocks and strains are transmitted directly to the motor support, removing all load from the stator excepting that of motor torque.

When the front end bracket and stator are removed, the pulley and bearing bracket remaining bolted to the base will continue to support the rotor and gear, pulley, or other connection to the driven unit. Thus cleaning and examination

can be completed in less time than usual and without disconnecting the drive gear or pulley.

The motors are built with standardized units (rotors and stators) which are interchangeable for all types. Thus standard horizontal motors, shell-type motors, flange-type motors, vertical motors, or



Ideal Motor Partly Dismantled, Showing Construction.

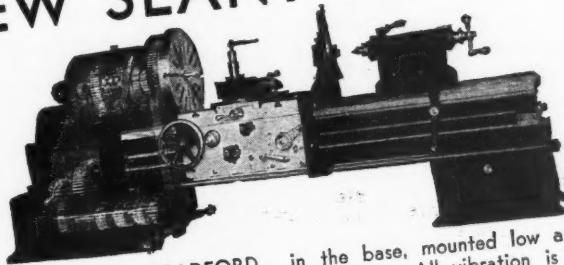
special applications of "built-in" motors require only the active elements, the same rotors and stators being applicable to all. The standardized units are applied not only to squirrel cage induction motors, but also to slip ring induction motors and direct current motors. It is said that the perfect interchangeability and accessibility of these motors make it possible for them to be built into closer quarters in motor-driven machines than has been possible heretofore.

Interchangeable ball, roller or sleeve bearings and anti-friction bearings are supplied as standard because of their many advantages.

The ball and roller bearings are of the cartridge type, so constructed that the motor can be taken down without dust or dirt entering the bearing. Zerk fittings are used to supply grease under automatic pressure. The sleeve bearing housings are designed so that they can be rotated for wall or ceiling mountings without the necessity of removing the bearing brackets and these sleeve bearings can also be replaced without removing the brackets or dismantling the motor.

The stator core is reinforced by eight steel bars, welded directly to steel rings which form the stator heads at each end of the core. This forms a welded steel

□□
**LOOK!
A NEW SLANT ON LATHES**



Just as soon as you put a BRADFORD "Lo-Drive" lathe on the job, you are assured of chatterless work at all times. And you can depend on getting these results because in BRADFORD "Lo-Drive" lathes all the fast running drive gears—the vibration producers of any lathe—are

in the base, mounted low and on a firm foundation. All vibration is dissipated as it travels upward . . . and never reaches the spindle.

This is an Exclusive BRADFORD Feature. Let us send you complete details. Write for an illustrated bulletin.

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Free machining, non-deforming, oil hardening die steel.

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Non-abrasive, hard wearing, for maximum production.

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Strong, tough, wear resisting for heavy duty tools.

These are but three of POLDI TOOL STEEL brands. The full line consists of the finest grades of High Speed and Tool Steels. Prompt delivery from our warehouse stocks.

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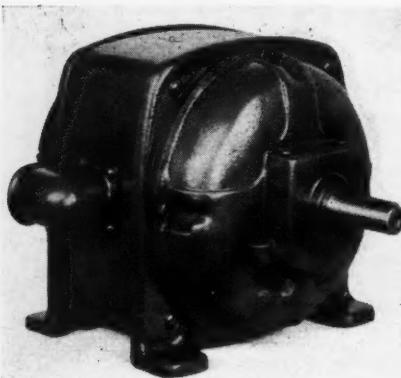
Representatives in BOSTON, HARTFORD, STAMFORD, PHILADELPHIA, CLEVELAND

cage which is ground to fit the two bearing brackets. The stator slots are skewed in relation to the rotor slots to assure quiet operation and absence of dead spots on starting position. All rotors and armatures are dynamically balanced, and the entire motor has been designed for hard, continuous service. Ideal unit-type motors are furnished in sizes from $\frac{1}{2}$ to 200 h. p.

G. E. Reversing Motor

The General Electric Company, Schenectady, N. Y., announces a new line of single-phase, repulsion induction motors, designated Type SCA, which are capable of unusually frequent reversal. The motors have the same appearance as the General Electric Type SCR general-purpose, single-phase motors, and are mechanically interchangeable in all respects with corresponding horsepower speed ratings of that type.

Available ratings range from $\frac{1}{4}$ h. p. to 5 h. p. at 1800 r.p.m., and from $\frac{1}{2}$ h. p. to 2 h. p. at 1200 r.p.m. All mechanical modifications which may be applied to the general purpose SCR motors are equally applicable to the new Type SCA. The starting torque is high and ranges



G. E. Reversing Motor.

from 225 to 275 per cent of normal full-load running torque, depending on the rating. The control for the motor is unusually simple, consisting of a full-voltage, 3-pole, reversing switch which may be of either manual or magnetic type.

Lufkin Telescoping Gage

What is said to be an entirely new idea in a telescoping gage has been announced by The Lufkin Rule Co., Saginaw, Michigan. The tool consists of a handle and two plungers, one telescoping into the other, which can be locked by a slight turn of the knurled screw in the end of the handle. The handle can always be locked in the center of the plungers, which permits perfect "feel" and accuracy. The ends of the plungers are hardened and ground to a radius which provides clearance in the smallest hole that can be entered by the gage. The gage is made in five sizes, to enter holes from $\frac{1}{2}$ in. to 6 in. diameter, and is offered either separately or in sets arranged in a compact red leatherette case.



Lufkin Telescoping Gage With Central Handle.

Despatch Bulletin No. 12

The Despatch Oven Company, 620 Ninth Street, S. E., Minneapolis, Minn., has issued Bulletin No. 12 in which the latest types of Despatch Conveyor Ovens are featured. The bulletin contains descriptions and illustrations of elevated and tunnel-type conveyor ovens, which are used for various baking and drying processes, to reduce handling costs, increase production, and secure a more uniform and higher quality product with lower operating costs. Copy free to any mechanical executive.

Heat Treatment of Steel

An 80-page booklet identified as No. 83 published by General Electric Co., Schenectady, N. Y., contains an extensive description of the processes and equipment employed in the heat treatment of steel, particularly the recent developments.

Production Meters

A leaflet of Durant Manufacturing Co., 1925 N. Buffum Street, Milwaukee, Wis., illustrates various designs and applications of "Productimeters" for use in measuring and counting products and materials.

Make the Repair Gang Earn Dividends



STOP making your machine tool repair men waste your profits. Stop making them spend hours to tear down a machine to get out a broken bolt or part.

KOZA RIGHT ANGLE DRILLS and GRINDERS will save that time and do it by power—not by "brute force." They eliminate the necessity of tearing down a machine to reach a broken bolt or part by drilling around the corner—at right angles.

These tools may be used for pipe and bolt threading, grinding, keywaying or countersinking. There is a tool for every requirement—in every industry.

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464 Augustine St. Rochester, N. Y.

The RHODES "Convertible" "Two Machines In One"

The RHODES "Convertible" Horizontal Shaper and Vertical Slotter—two machines in one—is adaptable to a great variety of uses. It provides an ideal means of handling a large number of small jobs ordinarily assigned to much larger machines, and does the work accurately, specifically and economically.



*Send
for illustrated
booklet.*

**THE RHODES MFG. CO.
WALTHAM, MASS.**

WHITON LATHE CHUCKS

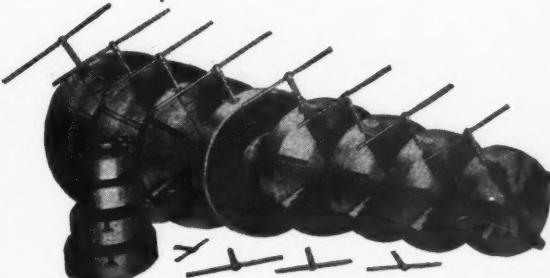
*For
a Sure Grip!*

WHEN work must be held rigidly and securely for accurate machining at top speeds—WHITON Lathe Chucks prove their superiority!

WHITON Chucks—and there's one for every requirement—are good chucks. Their design and workmanship assure you dependable service over a long period of time.

Get a WHITON Catalog—it shows the complete line of WHITON Chucks as well as many special chucks built for special requirements.

Here is a group of WHITON Steel Body Independent Chucks designed to hold heavy work under heavy cuts at high speed. The one-piece body resists sudden strain.



**THE D. E. WHITON
MACHINE CO.**
NEW LONDON CONN.

For Your Catalog Library

Check any of these useful publications that you want, write your name, firm name, title, and address on the margin, then tear out the page and send to Modern Machine Shop, 128 Opera Place, Cincinnati, Ohio. They will be forwarded to you promptly without cost or obligation. Please restrict your list to not more than ten.

Pointers on Internal Grinding: A folder containing data on the selection of internal grinding spindles, selection of grinding wheels, methods of holding work, grinding bushings, grinding holes with keyways or slots, and other useful information will be sent free to any machine shop executive. Address Abrasive Company, Tacony and Fraley Street, Philadelphia, Penna.

High Speed Tapping: The various types of Alto Motor-Driven, High Speed, Self-Contained Tapping Machines are described and illustrated in a series of folders that have been issued by The Alto Manufacturing Co., 1648-52 Wolfram St., Chicago, Ill. Free upon request.

Ames Gages: Catalog No. 50, issued by the B. C. Ames Company, Waltham, Mass., contains complete descriptions and illustrations of the dial gages, gage heads, upright gages, cylinder gages, dial micrometers, and precision verifiers, special gages and attachments made by this company. Copy free upon request.

Steel Furniture for the Shop: The complete line of steel furniture made by the Angie Steel Stool Co., Plainwell, Michigan, including steel stools and chairs, steel foremen's desks, lockers, tables, tool stands, machine tenders, shop boxes and pans, from bar racks, trucks, bench legs, and bench drawers, is described and illustrated in Catalog "C," which is issued free to machine shop executives.

Stop Tap Breakage: A booklet that tells how to stop the breakage of taps, reamers, and other tools, by the use of a friction chuck, also how to use the chuck for setting studs or nuts, has been issued by The Apex Machine Co., 200 Davis Ave., Dayton, Ohio. Sent free upon request.

Machine Shop Accessories: Catalog B-27, issued by the Armstrong Bros. Tool Co., 328 N. Francisco Ave., Chicago, Ill., describes the line of tool holders, boring tools, wrenches, pipe tools, ratchet drills, lathe dogs, and other tools manufactured by this company.

Hold Odd-Shaped Pieces Securely: A vise in which odd-shaped work can be held securely without the need of special jaws or fixtures is described in a folder that has been issued by The Avey Drilling Machine Co., P. O. Box 487, Cincinnati, Ohio. Copy free upon request.

Hobs and Milling Cutters: A complete line of milling cutters and hobs for cutting all kinds of gears, splines, sprockets and other forms is described in Catalog G, issued by the Barber-Colman Company, Rockford, Ill. Descriptions and illustrations of the Barber-Colman hobbing machine and hob-sharpening machines are included. Sent free on request.

All-Geard Drilling and Tapping Machines: A catalog describing in detail the various types of all-geard, self-rolling, drilling and tapping machines made by the Barnes Drill Co., 801-851 Chestnut Street, Rockford, Ill., will be sent free upon request.

Modern Drilling Equipment: Circulars describing the various types and sizes of Barnes upright drills, multiple drills and horizontal drilling machines made by this company have been issued by the W. F. & John Barnes Co., Rockford, Ill.

Automatic Oiled Die Sets: The automatic oiled die sets, die shoes, punch holders, leader pins, bolster plates, bushings, and other standard die parts made by the E.

A. Baumbach Manfg. Co., 1806 S. Kilbourn Ave., Chicago, Ill., are described in Catalog No. 5, which has been issued by that company. Sent free upon request.

Boker Keyless Chuck: A chuck that is built of three units, grips like a vise, and needs no key is described in a pamphlet that can be obtained by addressing H. Boker Co., Inc., 103 Diana St., New York, N. Y.

Bradford Precision Lathes: Precision Lathes for the tool room and for general manufacturing purposes, all-gearred and cone types, belt or motor driven, are described and illustrated in a catalog that is issued by The Bradford Machine Tool Co., 657-671 Evans St., Cincinnati, Ohio. The catalog also includes descriptions of taper, relieving, turret and other lathe attachments. Sent free upon request.

Reduced Costs By Face-Grinding: Stock on flat surfaces can be removed at high speed and low cost by grinding on a hydraulically-operated face-grinding machine. Write for bulletin to The Bridgeport Safety Emery Wheel Co., Inc., 1264 W. Broad Street, Bridgeport, Conn.

How To Sharpen Staggered Tooth Cutters, Helical Milling Cutters, and Two-Lipped End Mills: A series of pamphlets on these subjects can be obtained without charge by addressing the Brown & Sharpe Mfg. Co., Providence, R. I.

Disc-Inspected Tool Steels: A bulletin discussing the advantages of disc-inspected tool steels can be had by writing to The Carpenter Steel Co., Reading, Penna.

Gears Of All Kinds are described and illustrated with specifications, in Catalog 90, which has been issued by the Chicago Gear Works, 105-9 S. Jefferson St., Chicago, Ill.

Mounted Grinding Wheels: Grinding wheels for use in small holes such as are to be found in bushings, gears, etc., mounted and ready for use, are described in a bulletin that can be had by addressing the Chicago Wheel & Mfg. Co., 110 S. Aberdeen Street, Chicago, Ill.

Rapid Traverse Planers: Cincinnati Hypro Planers, made by the Cincinnati Planer Co., Cincinnati, Ohio, are described in a new catalog that has been issued by this company.

Electric Tools: The complete line of "The Cincinnati" Electric Drills, Grinders, Buffers, etc., manufactured by the Cincinnati Electrical Tool Company, Cincinnati, Ohio, is fully described and illustrated in their new catalog. Free upon request.

Bolender Gear Burnishers: Gears will operate more smoothly and more silently if burnished. Full description of the Bolender Gear Burnisher can be had by addressing the City Machine & Tool Works, Third and June Sts., Dayton, Ohio.

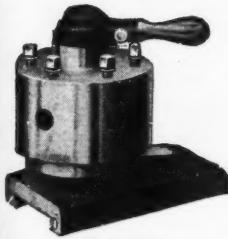
Handbook For Drillers: The Cleveland Twist Drill Co., 1242 E. Forty-ninth St., Cleveland, Ohio, has published a book in which the various parts of the twist drill are described, and which tells how to grind a drill correctly. The troubles that result from incorrect grinding are described and illustrated and several chapters are devoted to the subjects of speeds, feeds, materials, cutting compounds, and so on. Sent free upon request.

Columbia Superior Shapers: Bulletin No. 17, issued by The Columbia Machine Tool Co., Hamilton, Ohio,

January, 1931

Modern Machine Shop 121

STANDARDIZED LATHE TURRETS



STYLE "A"
Round Head for Round
Shank Tools.

8 Styles

12 Sizes

For any
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new.

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FAY & SCOTT

DEXTER, MAINE

DRILL VISE

With and Without Jig Attachments

3 sizes, 6", 9" and 12" jaws

Often used on Miller, Shaper or Planer

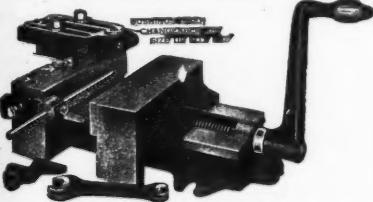


Fig. 1. With Jig Attachments

The attachments mean you can do much duplicate drilling without the cost of a jig. Any vise will pay. More time is consumed in catching work than drilling it.

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THE GRAHAM MFG. CO.
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Multiple Units

From Single Drills

Designed to fit any type of drill press, a U. S. Drill Head converts any single spindle drill into a multiple unit quickly.

No time wasted making adjustments—spindles are fixed. Any number of holes, fifty if necessary, can be drilled as easily as one.

We will design a U. S. Multiple Drill Head to meet your individual requirements. Tell us your needs. Address

The United States Drill Head Co.

1954 Riverside Drive

Cincinnati, O., U. S. A.

describes and illustrates the line of heavy duty shapers made by this firm. Copy free upon request.

Columbia Tool Steel Handbook: A book containing valuable information concerning the making of tools, heat treating, uses of hardness testing instruments, uses of the quenching bath, drawing bath, and other heat treating equipment, and together with tables and other useful information can be obtained without charge by addressing the Columbia Tool Steel Co., 550 E. 14th St., Chicago Heights, Ill.

Information For Broach Users: The Connecticut Broach & Machine Co., New London, Conn., has prepared a booklet listing the standards adopted by the S. A. E. covering the design of square, serrated or spline fittings, and including other information of value to the broach user. Copy free upon request.

Motorize Your Cone Pulley Lathes: An attachment that can be applied to your lathe with four bolts makes it possible to motorize and modernize your lathes. Write for information to Cullman Wheel Co., 1336 Altgeld St., Chicago, Ill.

Die Makers' Supplies: A complete line of die sets, leader pins, bushings, and other die makers' supplies are described in a book that is issued by the Danly Machine Specialties, Inc., 2104 South 52nd Avenue, Chicago, Ill. Sent free upon request.

Grinding Wheel Dressers: All of the different types of grinding wheel dressers made by the Desmond-Stephan Mfg. Co., Urbana, Ohio, including Desmond-Huntington, Desmond-Sherman, Zig-Zag, Diamo-Carbo, and diamond dressers, are described and illustrated in a catalog that has been published by the firm mentioned. Free upon request.

Precision Grinding: A booklet which describes and illustrates the most modern methods of performing all kinds of precision grinding operations, showing how the Dumore grinder can be applied to various kinds of machine tools, has been published by The Dumore Company, Racine, Wis. Copy free upon request.

Interchangeable High Production Tools: Catalog No. 28, issued free by the Eclipse Counterbore Co., 7410 St. Aubin St., Detroit, Mich., describes and illustrates the interchangeable counterbores, spot facers, end form cutters, and other end cutting tools made by this firm.

Grooved Cast Iron Pulleys: All sizes of grooved cast iron pulleys, made by Efficient Machine Shop, 147 Baxter St., New York City, are listed in a circular that can be had by writing this firm.

Lathe Turrets of eight different types and twelve sizes are described and illustrated in Circular No. 18, issued by Fay & Scott, Dexter, Maine. Copies free upon request.

Precision Measuring Instruments: The latest types and models of dial indicators, thread lead test gages, pitch gages, thickness gages, dial comparators, and other precision measuring instruments marketed by the Federal Products Corporation, Providence, R. I., are described and illustrated in a book that will be sent free upon application to this firm.

The Involute Gear Simply Explained: A direct, clear explanation of the theory and principles of involute gearing without the use of higher mathematics can be obtained without charge by addressing The Fellows Gear Shaper Co., 78 River St., Springfield, Vt.

Questions To Ask Before Buying a Jig-Boring Machine: A list of the fine points to look for in a jig-boring machine, with descriptions and illustrations of the working parts of the Swiss Jig Borer, can be obtained free by addressing The R. Y. Ferner Co., 1511 K St., N. W., Washington, D. C.

Formica Silent Composition Gears: A booklet telling about the uses and advantages of Formica Silent Shock

Absorbing Gears, and containing a considerable amount of valuable data with rules and tables for laying out, cutting and using gears. Sent free by Formica Insulation Co., 4632 Spring Grove Avenue, Cincinnati, Ohio.

Fosdick Drills: This publication gives details as to the design and construction of Fosdick Radial, Upright, and Sensitive Drills. Published by the Fosdick Machine Tool Co., Cincinnati, Ohio.

Tungsten-Carbide Tipped Tools: The boring tools, counterbores, form cutters, facing heads, reamers, spot facers, and other tools made by The Giring Tool Co., 1629 West Lafayette Blvd., Detroit, Mich., made with or without tungsten-carbide tips, are described and illustrated in Catalog No. 20. Copy free upon request.

Modern Grinding Equipment: The complete line of universal tool and cutter grinders, surface grinders, drill grinders, tap grinders, and other grinding machines made by the Gallmeyer & Livingston Co., 336 Straight St., S. W., Grand Rapids, Michigan, is described in a series of bulletins that have been issued by this firm. Free upon request.

The Schaffner 11-In. Lathe is described and illustrated in a bulletin which can be obtained without charge by addressing The General Radial Drill Co., 1767 Elmore Street, Cincinnati, Ohio.

Adjustable Blade Cutters: Hollow mills, facing tools, face mills, milling cutters and other production tools with adjustable, interchangeable blades are described and illustrated in a booklet that is issued free by the General Manufacturing Co., 141 N. Water St., Rochester, N. Y.

Take Care of Your Tools by keeping them in a convenient, strong, and fine-looking chest. A catalog of tool chests, complete with descriptions and illustrations, can be had by addressing H. Gerstner & Sons, 1283 Columbia Street, Dayton, Ohio.

Engraving and Die Sinking time can be reduced to the minimum by the use of a Gorton Universal Die Sinking and Engraving Machine Bulletin free upon request.

Machine Vises of all sizes for use with machine shop equipment are described in a circular that will be sent free upon application to The Graham Mfg. Co., 69 Willard Ave., Providence, R. I.

Greaves-Klumau Lathes: A book containing complete descriptions of the latest types of lathes made by this firm has been issued by the Greaves-Klumau Tool Co., Oakley, Cincinnati, Ohio.

Swiss Files: The complete line of Grobet Swiss Files for use in die and tool work or for other fine work is described and illustrated in Catalog "K" published by the Grobet File Corporation of America, 3 Park Place, New York, N. Y. Copy free upon request.

Drawing Tables: The Hamilton steel-base, adjustable drawing table is described in Catalog No. 7-MS, issued by the Hamilton Mfg. Co., Two Rivers, Wis. Copy free upon request.

Grinding, Polishing and Buffing Machines of the latest types are described and illustrated in a series of bulletins that have been issued by the Hammond Machinery Builders, Kalamazoo, Mich. Copies free upon request.

Texdrive Grinders for Vitrified or High Speed Wheels: A six-page bulletin No. 43 describes in detail and illustrates the advantages of the new Hisey Texdrive Grinder—stressing especially the multi-speed and single-speed machines. Write for a copy to The Hisey-Wolf Machine Co., Colerain and Marshall Sts., Cincinnati, O.

Precision Bench Lathe Work can only be done on finely-built, accurate machines. The complete line of Bjorth Precision Bench Lathes is described and illus-

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**TELESCOPING
GAGES**



Both telescoping plungers move in the head so the handle can always be located in the center of the tool. This is an exclusive feature and one which permits that perfect balance and feel so essential to accuracy.

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THE LUFKIN RULE CO.
SMALL TOOL DIVISION
SAGINAW, MICHIGAN

**TWENTIETH CENTURY
BALANCING TOOL**

*Always
on
the
level*



The most practical, sensitive and inexpensive device manufactured for balancing pulleys, cones, armatures, fly wheels, polishing wheels, etc. Will set anywhere and is easily portable. In sizes up to 24,000 pounds capacity.

Ask for the Bulletin

Sundstrand Machine Tool Co.
ROCKFORD, ILL.



**NIELSEN LIVE
CENTERS**

*Improve Lathe
Accuracy!*

Equip your tailstocks
with Nielsen Ball Bear-

ing Lathe Centers... they improve
the accuracy of your lathe and
allow you to work to closer limits.
The long spindle and bearing ar-
rangement keeps the center-point
in perfect alignment, eliminating all

danger of the work wob-
bling while under cut.

Thus, you can increase production,
save time, and cut costs by using
Nielsen Live Centers. There's a
Nielsen Center for every need, too
... write for a bulletin!

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NIELSEN, INC.
LAWTON, MICHIGAN
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Foreign Representative: Gaston E. Marbaix, Ltd., Adelaide House, King William Street, London, E. C. 4.

trated in a catalog that has been issued by Hjorth Lathe & Tool Company, 24 School Street, Boston, Mass. Copy free upon request.

Speed Reducers: A catalog of speed reducers up to 200 h.p. and built to deliver any ratio desired in standard size units can be obtained by addressing The Horsburgh & Scott Co., 5110 Hamilton Ave., Cleveland, Ohio. Give firm name.

"Houghton's Refrigerant Base" and "Hoent"—metal cutting oils manufactured by E. F. Houghton & Co., Philadelphia, Penna., are fully discussed, together with their outstanding properties, in two booklets which can be obtained without charge by addressing this firm.

Useful Tool Information: The Illinois Tool Works, 2503 N. Keefer Ave., Chicago, has published a catalog which describes and illustrates the standard and special cutters, mills, hobs, gear cutters, thread cutters, saws, reamers, and other tools made by this firm. The book also contains a number of useful tables and formulas. Copy free upon request.

Assembling with Electricity: Light, portable electric tools for drilling, tapping holes, and for driving screws are described in a booklet which can be had without cost by addressing the Independent Pneumatic Tool Co., 236 South Jefferson Street, Chicago, Ill.

Special Mill-Waukee-Mills of Standard Units: A milling machine of which the base, heads, columns, and other parts are built in standard units, thus enabling the user to order a machine that will be especially adapted for his job, is described and illustrated in Catalog No. 36, issued by the Kearney & Trecker Corporation, Milwaukee, Wis. Free to machine shop executives.

Keller Automatic Toolroom Machine for machining dies, metal patterns, jigs, core boxes, molds, and other irregular parts is fully described in a booklet that can be had free by addressing the Keller Mechanical Engineering Corp., 84 Front Street, Brooklyn, N. Y.

Koebel-Wagner Diamonds for Wheel Dressing: The Koebel-Wagner method of mounting diamonds and the use of the "Dykon" gage are discussed in a bulletin issued by the Koebel-Wagner Corporation, 144 Orange St., Newark, N. J. Free upon request.

Drill Around Corners: Holes can be drilled in close quarters by the use of the Koza Right Angle Drill. Can also be used for keywaying or countersinking. A descriptive pamphlet can be had by addressing Chas. A. Koza, 464 Augustine St., Rochester, N. Y.

Threading Machinery: Catalog No. 32, containing full descriptions of Landis threading machines, stay bolt threading machines, bolt factory threading machines, automatic forming and threading machines and chaser grinders can be had without charge by addressing Landis Machine Co., Inc., Waynesboro, Penna.

Flexibility in Cylindrical Grinding means increased production, need for less equipment, and lower costs. Send for information as to the advantages of Landis Hydraulic Grinders. Address Landis Tool Co., Waynesboro, Penna.

Cutter and Tool Grinding: A book that tells how to grind tools and cutters accurately and which also describes and illustrates the different types of LeBlond Universal Tool Room Grinders will be sent free upon request. Address, The R. K. LeBlond Machine Tool Co., Cincinnati, Ohio.

Air-Operated Work-Holding Devices: A booklet showing how air-operated chucks and devices of various kinds can be applied to different kinds of machines to save time and labor has been issued by The Logansport Machine Co., Logansport, Ind.

Rapid-Reading Micrometer: A new type of rapid-reading micrometer, designed to show the reading in nu-

merals, is described in Catalog No. 5, issued by The Lufkin Rule Co., Saginaw, Michigan. The catalog also contains descriptions of the micrometers, calipers, gauges, scales, squares, bevel protractors, and other tools made by this company. Free upon request.

Gears: Quick service on gears in either standard or special sizes is available from the Massachusetts Gear & Tool Co., 27 Nashua St., Woburn, Mass. Particulars upon request.

Time Saving Machine Equipment: How machining time can be reduced to the minimum by the use of Wixard chucks, collets and tap holders, turret tool posts, self-centering steadyrests, and other McCroskey equipment is told in a book that is issued by the McCroskey Tool Corporation, Meadville, Penna. Will be sent without charge.

Midwest Pin Drive Keyway Cutters are described and illustrated in a catalog that can be had by addressing Midwest Tool & Mfg. Co., 2362 West Jefferson Ave., Detroit, Michigan.

Polish at Any Speed: The Mitchell motor-driven polishing lathe, in which herringbone gears are used to transmit power from the motor shaft to the lathe spindle, can be operated at any desired speed. Bulletin can be obtained by addressing the Mitchell Engineering Co., Springfield, Ohio.

Compound Spot-Facing Tool: A spot-facing tool retracting, serrated roughing cutters and fixed finishing cutters in the same tool will break up the scale easily and do accurate work. Write for bulletin to Mumford-Dixon Co., 120 Philadelphia St., Hanover, Penna.

Nateo Drilling, Tapping, and Boring Equipment is the title of a publication that has been issued by The National Automatic Tool Co., Richmond, Ind. The book gives details as to construction and uses of "Nateo" multiple drilling and tapping machines.

"The Answer to Your Gear Problems": Information as to correct methods of cutting and finishing gears will be supplied without charge by The National Tool Co., Cleveland, Ohio. This firm also carries a complete stock of gear shaper cutters and markets the National-Cleveland Spur and Helical Gear Grinding Machine.

Solve Time with Expanding Mandrels: How expanding mandrels will solve the problem of turning pieces with odd-size holes, and will increase production on duplicate work, is told in a folder that will be sent free upon request by W. H. Nicholson & Son, 136 Oregon St., Wilkes-Barre, Pa.

Live Centers: The complete line of live centers manufactured by Nielsen, Inc., of Lawton, Mich., are fully described in a bulletin issued by this company. This bulletin is illustrated with photographs and blueprints of the Nielsen Center. Mailed free upon request.

Ball and Roller Bearing Data Sheets: A complete set of data sheets showing all the dimensions and loads at given speeds, and giving instructions for mounting precision ball bearing and Hoffmann roller bearings, can be obtained without charge by addressing the Norma-Hoffmann Bearings Corporation, Stamford, Conn.

How To Grind Cemented Tungsten Carbide: A booklet which describes and illustrates the correct methods of grinding tungsten carbide tools has been published by the Norton Company, Worcester, Mass. Copy free upon request.

"O. K." Tool System: The O. K. System for lathes, planers, shapers, boring mills, and other production machines consists of special forged steel holders with complete sets of tool bits of special design. Particulars can be had by addressing The O. K. Tool Co., Shelton, Conn.

January, 1931

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Improves Accuracy and Reduces Time!



The Mummert-Dixon Compound Spot Facer is the ideal tool for machining small bosses because it combines both roughing cutters and finishing cutters in one tool.

The serrated roughing cutters quickly and easily remove the hard scaly surface cutting the work to an approximate size, and are withdrawn without stopping the machine. Then, the finishing cutters shave off the serrated surfaces and finish the boss to accurate size.

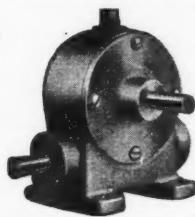
The result is an accurate and smooth surface obtained in less than half the time required by other methods.

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120 Philadelphia St. Hanover, Penn.



Speed Reducers



Ball and Roller Bearing Equipped

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Winfield H. Smith, Inc.

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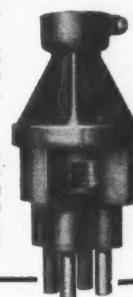
And, there's a good reason, too! Siewek tools make innumerable savings in time, energy and money. The three tools illustrated are good examples.

The cushion clamping of **SIEWEK DRILL JIGS** saves energy, loading time, allows closer accuracy and increases production. These jigs are built in nine sizes.



SIEWEK FIXTURE LOCKS save production costs by reducing spoiled work. The quick positive action insures a strong grip that holds work immovable, eliminating danger of shifting under cut. Nine sizes are available for practically all needs.

SIEWEK DRILL HEADS, particularly when used with Siewek Drill Jigs, assure a set-up that will save time and increase production. And, there's a Siewek Drill Head for every requirement.



Write for Our New Catalog No. 3

SIEWEK TOOL COMPANY
10232 Woodward Ave. Detroit, Mich.

January, 1931

Die Making Machines: How dies, templates, gages, etc., can be sawed out, filed, and lapped easily and accurately on Oliver die making machines is fully described in a bulletin issued by the Oliver Instrument Company, 1430 Maumee Street, Adrian, Mich. Mailed upon request.

"Fastenings" is the title of a booklet, issued by the Parker-Kalon Corporation, 192-196 Varick Street, New York, N. Y., in which are included the results of surveys made in fourteen different plants as to the efficiency of fastening methods. Copy free upon request.

Use the Right Tool Steel for the Job: Full information as to the difference in tool steels and the correct grade of steel for each purpose is contained in a folder that has been issued by Poldi Steel Corp. of America, 245-247 West 18th Street, New York. Copy free upon request.

Powell "Bio-Gum" Air Valves: Air is faster and more efficient than a brush for cleaning machine tables. The use of the Powell Bio-Gum for this purpose is discussed in a catalog that can be obtained by addressing The Wm. Powell Co., Cincinnati, O.

Do Your Bench Work on a Machine: Bench work that heretofore has been done by hand can now be done quicker, cheaper, and better on the P. & W. Vertical Shaper. Full particulars can be had by addressing Pratt & Whitney Co., Hartford, Conn.

Tapping Devices, Quick-Change Chucks, Stud-Setting Tools and Bench Tappers: A catalog describing the various types and kinds of tapping, drilling, and stud-setting devices manufactured by the Prochner Safety Chuck Company, 12 South Clinton Street, Chicago, Ill., can be obtained without charge by addressing this company. The catalog also tells the part that Prochner tools play in obtaining greater accuracy and less tap breakage.

Engine, Turret, and Gap Lathes are described in a series of bulletins that have been issued by The Rahn-Larmon Co., 2935 Spring Grove Ave., Cincinnati, Ohio.

Shape or Slot With This Machine: The Rhodes Convertible Shaper, made by The Rhodes Manfg. Co., Wal-tham, Mass., can be used for horizontal shaping or vertical slotting. Details upon request.

Fulmore Industrial Clutch: A multiple disc clutch, made in two types, to run in oil or dry, and which is so built that it can be operated at high speeds, is illustrated and described in a folder that will be sent free by the Rockford Drilling Machine Company, Rockford, Ill.

Hy-Draulic Shaper-Planer: The most modern features are embodied in the design of the Rockford Hy-Draulic Shaper-Planer, which is intended for work that would otherwise go to the small planer or large shaper. Write for folder to Rockford Machine Tool Co., 2414 Kishwaukee Ave., Rockford, Ill.

Automatic Lubrication: Individually motor-driven pumps that keep the work flooded with lubricant are described in a booklet that has been published by the Ruthman Machinery Co., Front and Pike Sts., Cincinnati, Ohio.

Stop Belt Hook Accidents: Safety Belt Hooks grip the belt firmly, keep it in perfect alignment, and have no projecting points to injure the workmen. Write for information. Safety Belt-Lacer Co., Toledo, Ohio.

Full Automatic Hobbing: Small pinions, gears, ratchet wheels, and similar parts can be hobbed economically on a full automatic hobber with magazine attachment. For full details write the George Scherr Company, 142 Liberty St., New York, N. Y.

Stamp Your Name on Your Product: Full information as to the steel roller dies made by The Schwerdtle

Stamp Co., 10 Cannon Street, Bridgeport, Conn., can be obtained by writing this firm.

Equipment For the Shop: Vises for the bench, drill press, milling machine or shaper; angle plates; adjustable clamps, jacks and other tools for the machine shop, are described and illustrated in a booklet that is published by the Sheldon Machine Co., 3253-55 Cottage Grove Ave., Chicago, Ill. Copy free upon request.

Economics in Material Handling: A volume of facts about planned load handling, with actual examples of economies in time, material, and labor costs that have been effected with Shepard electric hoists will be sent free upon request to Shepard Niles Crane & Hoist Corp., 424 Schuyler Ave., Montour Falls, N. Y.

Simonds Files: A useful book on files showing the various styles made, their uses, cross-section, and cuts, and containing a number of reference tables and other information useful in a machine shop can be had by addressing Advertising Dept., Simonds Saw & Steel Co., 470 Main Street, Fitchburg, Mass.

Simplex Nesting Bins: Bins which may be used as individual containers, as tote-boxes, or "nested" to form stock-room sections are described in an illustrated circular published by the Simplex Tool Co., Woonsocket, R. I. Copy free upon request.

The Most Efficient Speed for the operation of special by the use of the WHS Speed Reducer and how it can production units, power conveyors, and other machinery be obtained is told in a bulletin that will be mailed free by Winfield H. Smith, Inc., 30 Eaton St., Springfield, N. Y.

A Snyder Tool Set-Up: consisting of a Snyder ball-bearing multiple head, bushing plate, and work holding fixture, will convert a single spindle drill into a multiple drill at small cost. Particulars upon request. Address Snyder Tool & Eng. Co., 3400 E. Lafayette Ave., Detroit, Michigan.

Speed and Accuracy in Straightening: The Springfield Straightening Press is an ideal tool for use in straightening any length or size of rough or finished work. Send for illustrated folder. Address The Springfield Machine Tool Co., 630 West Southern Avenue., Springfield, Ohio.

Accurate Gages Speed Production: The complete line of snap, plug, ring, pin, dial indicator, and special gages made by the Standard Gage Co., Inc., Poughkeepsie, N. Y., is described and illustrated in Catalog No. 4, which can be had without charge by addressing this firm. Johansson gage block sets and accessories are also listed in this book.

Machinists' Tools and Gages: Catalog No. 24, issued by the L. S. Starrett Co., Athol, Mass., describes and illustrates the complete assortment of machinists' fine tools and gages made by this firm. Copy free upon request.

"Squar-It" Clamping Blocks will hold odd shapes and eliminate necessity for special jigs. Can be used on any machine. Write to Homer Strong & Co., Inc., Rochester, N. Y., for descriptive circular.

Ridgid Milling Principles and Practices: A book that shows how the Ridgidmill can be adapted to various kinds of usual and unusual milling operations, and which describes in detail the work that can be handled by this machine has been issued by the Sundstrand Machine Tool Co., Rockford, Ill. Copy free upon request.

Save Cutting Oil: How cutting oil can be separated from chips and thus reclaimed by the use of a centrifugal chip "wringer," is told in a bulletin that is issued free by the Tolhurst Machine Works, Troy, N. Y.

OTHER PUBLICATIONS LISTED ON PAGES 120, 122, 124 and 128.



5 minutes per panel

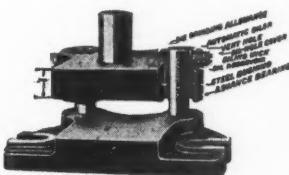
With an Oliver Die Making Machine a radio manufacturer is turning out completed bakelite panels quickly and at low cost. Between times it is used on a variety of sawing, filing and lapping operations. Investigate this versatile machine now.

Send for illustrated bulletin today.



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1430 Maumee Street Adrian, Mich.

BAUMBACH Automatically Oiled DIE SETS



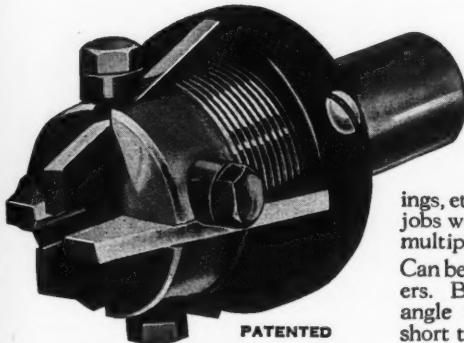
Standardized die sets, embodying many exclusive features, and a listing of 70,000 stock sizes afford a service that is unsurpassed.

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Made in 7 different styles



A Genesee Adjustable Hollow Mill can be made for every job

WRITE FOR CATALOGUE

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Chuck With Air: How time and labor can be saved by the use of air-operated chucks, cylinders, and other equipment is told in a book which describes "Hopkins' Air-Operated Equipment." Published by The Tomkins-Johnson Company, 620 N. Mechanic St., Jackson, Mich. Sent free upon request.

A Simplified and Improved Drive Control for Machinery: Two distinct types of plate clutches that have proved successful highly in the driving mechanism of machine tools are described and illustrated in a bulletin that will be sent free by the Twin Disc Clutch Company, Racine, Wis.

Multiple Drilling With a Single-Spindle Drill: Methods by which multiple drilling may be done on a single-spindle drill, using multiple spindle drill heads, are discussed in a bulletin that is issued by The United States Drill Head Co., 1954 Riverside Drive, Cincinnati.

Electrically-Driven Portable Tools: The "U. S." line of electric drills, die grinders, electric screw drivers, surface grinders, tool post grinders, and bench and floor grinders is described in Catalog No. 29, which has been published by The United States Electrical Tool Co., 2471 W. Sixth St., Cincinnati, Ohio.

Measuring Threads by Wires: Directions for micrometer gaging of screw threads by the use of wires are given in Circular W26, published by The Van Keuren Co., Waterbury, Mass. Copies may be obtained free by addressing this company.

Tool Chests for Machinists and Toolmakers: The complete line of fine tool chests for machinists and toolmakers made by J. M. Waterston, 420 Woodward Ave.,

Detroit, Mich., is described in Catalog No. 25. Ask for it.

Screw Machine Products: Full information as to the manufacturing service on screw machine products maintained by Western Screw Products Co., 19-31 St. George St., St. Louis, Mo., will be sent upon request.

Wetmore Adjustable Reamers: The exclusive features of the Wetmore Adjustable Shell Reamer are discussed in Catalog No. 29, issued by the Wetmore Reamer Co., 62 27th St., Milwaukee, Wis. Copy free upon request.

Power Drive in Any Position: The modern flexible shaft makes it possible to drive all kinds and types of tools in places and positions impossible of access with straight-shaft machines. Ask The S. S. White Dental Mfg. Co., Industrial Division, 150A West 42nd Street, New York, N. Y., for the "Flexible Shaft Handbook." Copy free to any mechanical executive addressing this firm on his firm letterhead.

Change Punches Without Removing Die: The user of Hercules Interchangeable Punches and Retainers can change punches without removing the die from the press. Information that will help to lower die-building costs, reduce lost time for repairs, and increase press production can be had by addressing Whitman & Barnes, Inc., Detroit, Michigan.

Whiton Steel Body Lathe Chucks: The various types and sizes of steel body chucks for lathes that are made by the D. E. Whiton Machine Co., New London, Conn., are described and illustrated in a booklet that will be sent free upon application to this firm.

OTHER PUBLICATIONS LISTED ON PAGES 120, 122, 124 and 126.

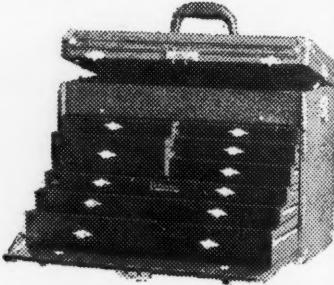
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All types and sizes up to 12 ft. in diameter.
Rush service for breakdowns. Also a complete line of speed reducers.

The Horsburgh & Scott Co.
5110 Hamilton Ave. Cleveland, Ohio

MACHINISTS AND TOOL-MAKERS TOOL CHESTS



Tool Chests that are right in construction and price.

Send for No. 25 Catalogue of Tool Chests and Tools.

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DON'T - work in the dark

WHAT kind of steel is it? Is it oil hardening or water? What job is the tool for? What is the job number? Who made it?

These questions are answered economically and speedily if the article is properly marked.

Schwerdtle Steel Alphabet and Figure dies in sets, are designed for just such work as marking dies, tools, parts, and for all miscellaneous marking.

The simplest mistakes are the costliest, and the remedy for them is very inexpensive.

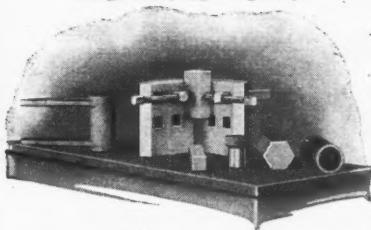
INSIST on PLAIN, ADEQUATE LABELING OF TOOLS

THE SCHWERDTLE STAMP CO.
13 CANNON STREET BRIDGEPORT, CONN.

SQUAR-IT CLAMPING BLOCKS

Small Size, $2\frac{1}{8}$ " Capacity

Large Size, $4\frac{1}{2}$ " Capacity

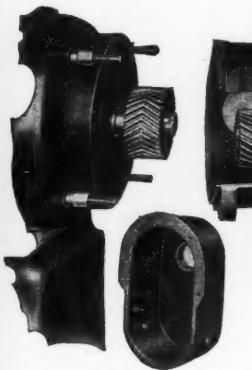


HUNDREDS OF THESE NEW FIXTURES NOW IN USE THROUGHOUT THE UNITED STATES

THIS block will hold various shapes and eliminate many special jigs. It can be used to advantage on the shaper, grinder, lathe, milling machine, engraving machine and for quick squaring and clamping, laying out work, etc.

Write for descriptive circular and prices

HOMER STRONG & CO., INC.
ROCHESTER, N. Y.



Exposed view of the Herringbone Gear Drive and Spindle Assembly of the MITCHELL Motor Driven Polishing Lathe.

Here You Can SEE FOR YOURSELF



—the herringbone gear drive of the Mitchell motor driven Polishing Lathe which insures

practically noiseless operation and delivers more than 98 per cent of the motor power to the polishing wheel.

You can see for yourself the many mechanical and operating advantages of this machine which give you years of dependable service at practically no maintenance cost.

Write for a bulletin . . . and you will see for yourself how this machine fits into your production line.

The Mitchell Engineering Co.
SPRINGFIELD OHIO

THE SCRAP PILE

By GEO. ALEXANDER MANN

Another laughy wow is the farmer who drives thirty or forty miles to town an' can't find parking space for his Cadillac so he can hear the farm relief speech.

Poor Kid

Poor Clarence dear's so bashful,
He is shy for sure,
They say he packed mistletoe
On his wedding tour.

Many a "Good Buy" spells "Farewell."

Answer Me That

Which is the more remarkable?
The thoughts of it make me blink,
What a drink will do for a man
Or a man will do for a drink?

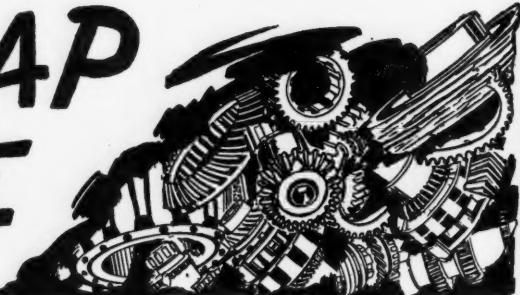
A sap who drinks present day gin
ought to be shot—an' he usually is.

The trouble with four-in-hand ties
on so many o' the fat guys, they have
to serve out as coffee strainers.

Ain't Ut Tha Troof?

Men 're drivin' faster,
With long skirts aroun'
There's not so many curves
Fer to slow 'em down.

Story tellin' is like liquor—a little
now and then's enough.



Some men hate women without any reason—others like 'em that way.

Bridge

"You know I have no heart,
Your bridge gives me a pain"
She sweetly said "No hearts?"
You mean you have no brain."

Then We'd All Be Happy

If the improvement in business would only keep pace with the improvement in predictions.

Poor Sap

Here lies a gilly,
Lost his life,
Tried eatin' Jello
With a knife.

"Life is a heterogeneous collection of irreconcilable phenomena," says a scientist. An' here we been thinkin' all along that it was just an ordinary collection of I-O-U's.

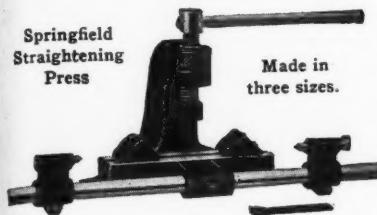
There With the Grab

"He rattles on like a flivver,
Your boy friend talks too much,"
"Yes, I know, but daddy dear,
I love him for his clutch."

When a guy proclaims that the world owes him a living, his appearance is usually proof enuff that he's a rotten collector.

CUT YOUR STRAIGHTENING COSTS

Springfield
Straightening
Press



Made in
three sizes.

THE Springfield Straightening Press is the ideal tool for straightening any length of rough or finished work—truing sprung tools—testing and balancing cams, or crank shafts—and scores of other jobs.

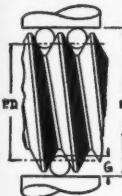
Place it on the bench—it saves your operators' time by eliminating waste steps, and allowing quicker handling of work.

Send for illustrated folder suggesting many uses.

The Springfield Machine Tool Co.
630 West Southern Avenue Springfield, Ohio

We also manufacture Engine Lathes and Shapers.

Thread Measuring Wires



Made to Bureau of Standards Specifications. We have over 250 sizes of measuring wires and reversible plug gages in stock. Circular W26 gives full data on measuring wires and their uses. How many copies do you want? Have you Catalog No. 28, showing Light Waves, Gage Blocks, Plug gages. Micro-meter laps?

THE VAN KEUREN CO., Watertown, Mass.



GEARS IN STOCK Immediate Delivery

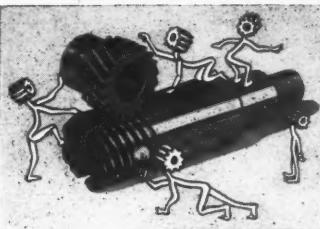
Gears, speed reducers, sprockets, thrust bearings, flexible couplings, pulleys, etc. A complete line is carried in our Chicago stock. Can also quote on special gears of any kind. Send us your blue prints and inquiries.

Write for Catalog No. 80

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769-763 W. Jackson Blvd., Chicago, Ill.

GEARS

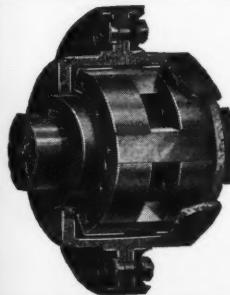


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Mass. Gears

*is accounted for through proper engineering and accurate machining.
It is easy to prove.*

Massachusetts Gear & Tool Co.
27 Nashua St. Woburn Mass.



"Nicholson" Flexible Couplings

Ample compensation for practical misalignment and liberal allowance for lateral floats—a big help to an efficient drive.

Utilizing centrifugal force, with no springs or rubber to break or deteriorate, Nicholson Flexible Couplings insure quiet, efficient operation with minimum wear. *Details in Bulletin 329, may we send it?*

W. H. NICHOLSON & CO.

136 Oregon Street

WILKES-BARRE, PA.

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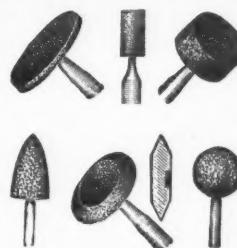
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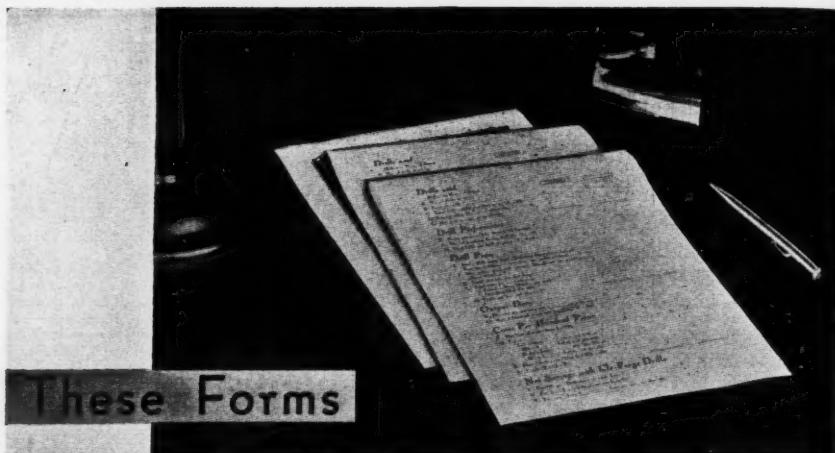
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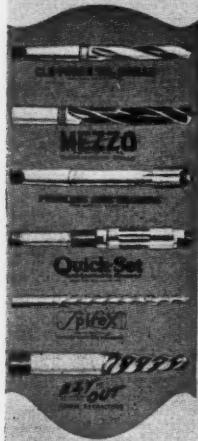
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